OPERATING INSTRUCTIONS

TYPE 1218-B

UNIT OSCILLATOR

900—2000 MHz

GENERAL RADIO COMPANY

B

INSTRUCTION MANUAL

TYPE 1218-B

UNIT OSCILLATOR

900—2000 MHz

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TABLE OF CONTENTS

Section 1. INTRODUCTION 1

1.1 Purpose 1
1.2 Description 2
1.3 Modulation 6
1.4 Swept-Frequency Operation 8
1.5 Accessories Required 10
1.6 Accessories Available 10

Section 2. INSTALLATION 13

2.1 Connection to Power Supply 13
2.2 RF Output Connections 14
2.3 Modulation Connection 14
2.4 Mechanical Attachment to Power Supply 15
2.5 Rack Mounting 15

Section 3. OPERATION 17

3.1 Equipment Turn-On 17
3.2 Frequency Adjustment 17
3.3 Level Control 18

Section 4. APPLICATIONS 19

4.1 General 19
4.2 Immittance Measurements (One Port) 19
4.3 Transfer-Function Measurements (Two Ports) 21
4.4 Insertion-Loss Measurements 21
4.5 Frequency Conversion 22
4.6 Use as a Transfer Oscillator 22

Section 5. PRINCIPLES OF OPERATION 24

5.1 General 24
5.2 Circuitry 24

Section 6. SERVICE AND MAINTENANCE. 29

6.1 Warranty 29
6.2 Service 29
6.3 Performance Evaluation. 30
6.4 Trouble Analysis 34
6.5 Removal of Covers 40
6.6 Tube Replacement 41
6.7 Lubrication. 43
6.8 Tracking Adjustments 43
6.9 ΔF Control Alignment 46
6.10 Main Frequency-Dial Adjustment 47
6.11 Vernier-Dial Adjustment 47
6.12 Level Control 47

Parts List and Schematic 48, 49

SPECIFICATIONS

Frequency Range: 900 to 2000 MHz (0.9 to 2.0 GHz).

Frequency Calibration Accuracy: ±1%.

Warmup Frequency Drift: 0.1% approximate total warmup drift.

Frequency Control: A 4-inch dial with calibration in MHz over 290° (10½-inch scale length), with a slow-motion drive of about 8 turns. Supplemented by a logging scale of 800 divisions.

ΔF Control: 1.8 turns for approximately 0.1% total range.

Output Power (Into 50 Ω): 200 mW (0.9 to 1.5 GHz) guaranteed minimum, dropping linearly to 130 mW at 2.0 GHz, with TYPE 1269-A or 1203-B Power supply.

120 mW (0.9 to 1.5 GHz) guaranteed minimum, dropping linearly to 80 mW at 2.0 GHz, with TYPE 1267-A, 1264-A, or 1201-C Power Supply.

Output Connector: Locking type GR874, located at rear. Adaptors available for other connector systems.

Level Control: Full output to about 20-dB attenuation easily set by 200° rotation, uncalibrated.

Modulation: An external audio-frequency voltage for plate modulation can be introduced at the front-panel MODULATION jack. The impedance there is about 6,000 Ω; approximately 30 V, rms, is required for 30% amplitude modulation. For 400- and 1000-Hz modulation, the TYPE 1311 Oscillator is recommended.

Power Supply: Four types of power supplies are recommended; the choice depends on the intended application.

The TYPE 1267 is fully regulated, for cw operation.

The TYPE 1269 is unregulated, for maximum power, cw.

The TYPE 1263 automatically controls the output level up to 2 V behind 50 Ω, cw or 1-kHz square-wave modulated.

The TYPE 1264 provides full-power cw or modulated operation: 1-kHz square wave or pulse at externally determined duty ratio and frequency up to 100 kHz.

The oscillator is available in combination with each of these power supplies, for either bench or rack mount.

Tube: One 5675 pencil triode.

Mounting: The oscillator is housed in an aluminum casting with gray-wrinkle-finished shield covers on right and left ends and a front panel similarly finished.

Accessories Supplied: TYPE 874-R22LA Patch Cord, phone plug.

Other Accessories Available: GR874 coaxial elements.

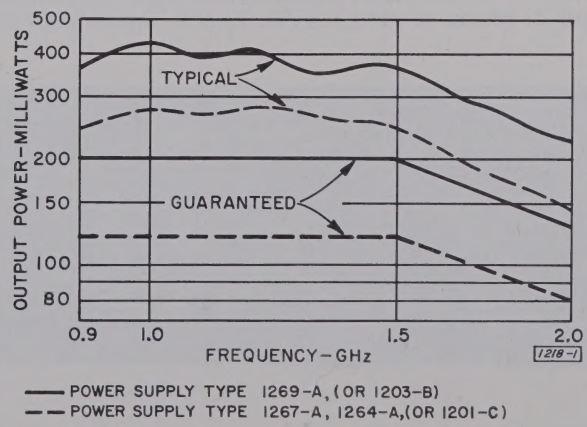
Dimensions: Width 12, height 7⅝, depth 9 inches (320 by 205 by 240 mm), over-all.

Net Weight: 14 lb (6.5 kg).

Shipping Weight: 25 lb (11.5 kg).

General Radio *Experimenter*, Vol 39, No. 7, July, 1965.

U.S. Patent Number 2,548,457.



Type 1218-B Oscillator power output into 50 ohms using various power supplies.

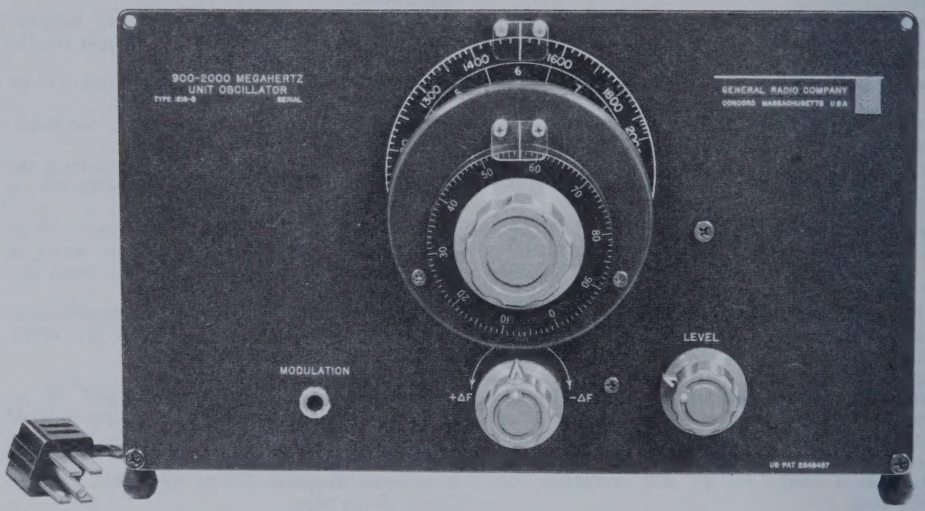


Figure 1-1. The Type 1218-B 900-2000 MHz Unit Oscillator. The power plug at left fits any of four General Radio power supplies which meet a variety of needs for regulation and modulation capability. Refer to paragraph 1.6.

SECTION 1 INTRODUCTION

1.1 PURPOSE.

The Type 1218-B Oscillator (Figure 1-1) is a general-purpose laboratory signal source, suitable for bench or rack mounting. A plot of typical power output over the frequency range 900 to 2000 MHz is shown with the specifications.

The oscillator will drive rf bridges, slotted lines, impedance comparators, and frequency converters. It can also serve as the pump for a parametric amplifier or as the local oscillator of a heterodyne receiver.

To afford maximum versatility, the oscillator is constructed without power supply. The packaging is compatible with that of a number of General Radio power supplies; thus, the user can readily assembly an rf source exactly tailored to his needs. Particular requirements for stability or modulation capability can be met by proper choice of power supply from those described in paragraph 1.6. Simple hardware kits permit quick mechanical attachment of oscillator and power supply, for bench use or rack installation, with common hand tools. A typical assembly is shown in Figure 1-2.

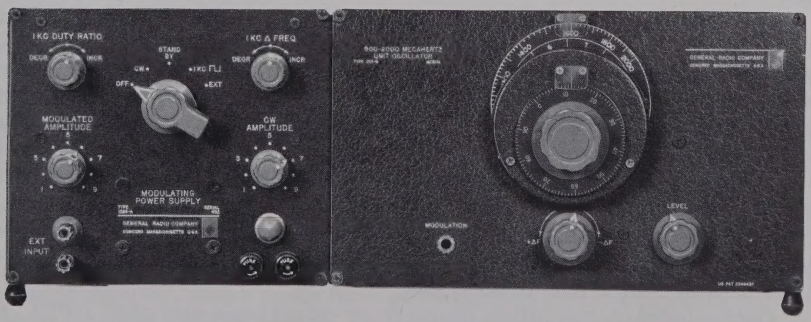


Figure 1-2. Type 1218-B4, a typical rf source for bench use. Oscillator and modulating power supply are joined to form a mechanically rigid instrument. The regulated power supply contains internal 1-kHz modulation (square-wave) and can be pulse- or square-wave-modulated externally. Complete plug-in interconnecting wiring is all behind panel.

Table 1-1
CONTROLS AND INDICATORS
(See Figure 1-1)

Name	*Type*	*Function*
none	Ganged resonant-line tuning mechanism	Main frequency control and indication
ΔF	Variable capacitance probe	Fine-tuning control
LEVEL	Rotary pickup loop	Controls rf power output

1.2 DESCRIPTION.

1.2.1 GENERAL.

The single-dial frequency control drives both plate and cathode tuned circuits of a single-triode oscillator, which is housed in a thick-walled, cast-aluminum cylinder for vibration isolation and minimum rf leakage. Rf shielding is completed by removable aluminum cans (fitted over flanges at each end of the casting), careful filtering of power-supply leads, and use of nonmetallic control shafts that pass through waveguide-below-cutoff tubes. The GR874 locking coaxial output connector preserves the shielding, while permitting the use of adaptors to any of the common military connector systems. For interior details, refer also to Section 5.

1.2.2 CONTROLS, INDICATORS, AND CONNECTORS.

Controls and indicators for the oscillator are listed and described in Table 1-1. Connectors are listed in Table 1-2. All controls are on the front panel.

Frequency settings within the wide range of the Type 1218-B oscillator are indicated by the four-inch main dial, which has a 10 1/2-inch-long custom-calibrated scale. The associated vernier drive covers that range in eight revolutions, each corresponding to a numbered, segment on the main dial. The 100 divisions on the vernier dial therefore provide 800 logging marks for precise resetting or interpolation.

Fine tuning over a range of about 2 MHz is controlled by nearly two turns of the pointer knob labeled ΔF. Thus, it is practical to set the oscillator within a few hundred hertz of a given frequency (about one part per million). Calibration of the main frequency dial is performed with this control at mid-range (ΔF pointer up).

Output level is controlled by the front-panel knob marked LEVEL, from essentially zero to full power. The useful range of the level control is about 20 dB.

The rf output connector is at the rear. In rack-mounted installations the signal can be brought to the front through the coaxial patch cord, fitted with a panel connector, which is supplied with rack-mounting kits.

Table 1-2
CONNECTORS

Location	*Name*	*Type*	*Function*
Front panel	MODULATION	Phone jack, 3-conductor closed circuit	Input for external amplitude modulation; plate-current metering point
Left side bracket	P	Phone jack, 2-conductor, closed circuit	Duplicate input for external amplitude modulation and measurement of plate current.
Left side bracket	G, K	Tip-jack pair (for .050-inch tips)	Voltage-metering points; input for external frequency modulation.
Bottom of instrument	(none)	8-pin plug	Modulation input connector for patch cord from Type 1264 power supply
On attached cord	(none)	5-pin plug	Power connector.
Rear	(none)	Coaxial connector	Rf output

The modulation jack is duplicated on the panel and on a bracket at the left of the instrument. These switching-type phone jacks are in series with the plate circuit. Access to grid and cathode circuits can be obtained at pin jacks (G and K) on the same bracket. A special connector for cathode modulation is located at the bottom of the instrument.

1.2.3 OUTPUT SYSTEM.

The output system consists of a coupling loop, mounted on the plate-line tuning plunger, which feeds the GR874 locking output connector by means of a very flexible coaxial cable. The angular position of the loop, controlled from the front panel, provides a range of approximately 20 dB in output level. At the high-frequency end of the tuning range, overcoupling is possible, with consequent reduction of power output, if the control is set fully clockwise. Power available into a 50-ohm load, with the LEVEL control set for maximum power at 2000 MHz, is shown in the figure accompanying the specifications.

1.2.4 FREQUENCY STABILITY.

Spectral purity in the output signal is enhanced by three design features. First, the cathode circuit is isolated from the heater, so that alternating current there does not modulate the oscillator appreciably. Second, an additional RC filter reduces any ripple on the plate-supply voltage. Third, the entire tuning assembly is specially mounted to reduce the transmission of acoustic energy from the main casting to the tube, where "microphonic" modulation can result. While the electrodes in the tube resonate at nearly 3 kHz, the resultant frequency modulation even at resonance is only a few parts per million at sound levels found in most laboratories.

A heater voltage change of 1% will cause a frequency shift of the order of 50 parts per million (.005%), while a 1% change in plate-supply voltage will cause a frequency shift of about 20 parts per million (.002%).

If the heater of the oscillator is operated from 6.3-V, 60-Hz ac power, hum modulation of the oscillator frequency has a peak deviation of the order of 100 Hz, or .07 parts per million. For critical applications, the Type 1267-A Power Supply is recommended because it furnishes regulated dc supplies for both plate and heater.

Typical warmup frequency drift characteristics are shown in Figure 1-3. The curve is equally applicable at any point in the tuning range. After three hours of undisturbed operation with the Type 1267 Power Supply, the frequency drift is likely to be determined mainly by room-temperature changes.

1.2.5 POWER REQUIREMENTS.

The power requirements are approximately 30 mA at 300 V dc, (positive side of plate supply grounded in the oscillator), and 370 mA at 6.3 V, ac or dc, heater supply floating. All General Radio recommended supplies will meet these requirements. See Table 1-5.

CAUTION

When a power supply other than a General Radio instrument is used, the high-voltage connection must be negative with respect to ground.

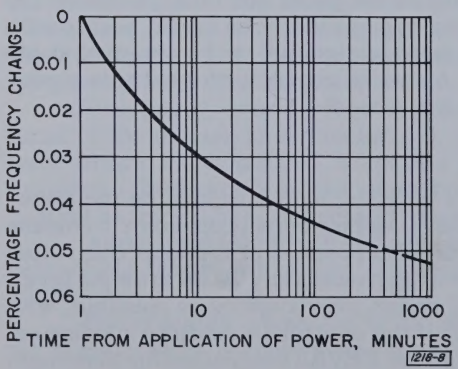


Figure 1-3. Typical warmup frequency-drift characteristics for the Type 1218-B oscillator.

1.2.6 EQUIPMENT SUPPLIED.

Table 1-3 lists and describes equipment supplied with the Type 1218-B oscillator when it is purchased separately.

TABLE 1-3
EQUIPMENT SUPPLIED

Item	*Part No.*
Type 1218-B 900-2000 MHz Oscillator	1218-9702
Type 874-R22LA Patch Cord, Coaxial	0874-9683
Phone plug for modulation input	4220-2000

Table 1-4 lists complete rf source configurations that include oscillator, power supply, and required accessories. Instructions that follow apply equally to the instrument alone or to the combinations listed.

TABLE 1-4
OSCILLATOR/POWER-SUPPLY
COMBINATIONS COVERED

Type	*Description*	*Catalog Number*
1218-B3	Includes Type 1263 Power Supply, Type 874-VRL Rectifier, patch cords, and attaching hardware	1218-9423
1218-B3R	Type 1218-B3 plus rack-mounting kit	1218-9543
1218-B4	Includes Type 1264 Power Supply and attaching hardware.(see Figure 1-2).	1218-9424
1218-B4R	Type 1218-B4 plus rack-mounting kit	1218-9544
1218-B7	Includes Type 1267 Power Supply and attaching hardware	1218-9427
1218-B7R	Type 1218-B7 plus rack-mounting kit	1218-9547
1218-B9	Includes Type 1269 Power Supply and attaching hardware	1218-9429
1218-B9R	Type 1218-B9 plus rack-mounting kit	1218-9549
1218-B7Q18	Includes Type 1267 Power Supply wired for 195-250 V ac input power	1218-9428
1218-B7RQ18	Type 1218-B7Q18 plus rack-mounting kit	1218-9548

NOTE

Comprehensive operating instructions for the appropriate power supply, plus detailed installation instructions where required, are furnished with the power supply.

1.3 MODULATION.

1.3.1 GENERAL.

In many applications, amplitude modulation of the oscillator permits increased detection sensitivity through the use of a tuned amplifier, such as the General Radio Type 1232. following the rf detector. Recommended modulators are described in paragraph 1.3.3.

1.3.2 AMPLITUDE MODULATION WITH SINUSOIDAL OR COMPLEX SIGNALS.

A jack on the front panel of the oscillator permits connection of a plate modulator such as the Type 1311; this jack is multipled behind the panel, at the lower left corner of the instrument, where it is labeled "P". The modulator must be able to carry the oscillator plate current, 30 mA dc, and to supply up to 30 volts, rms, for 30% modulation to a load impedance that varies from 9000 ohms at 900 MHz to 3000 ohms at 2000 MHz.

CAUTION

If a high resistance or open circuit is connected to either phone jack, the plate supply voltage will appear across the jack terminals.

1.3.3 SQUARE-WAVE AMPLITUDE MODULATION.

One-hundred-percent, square-wave, amplitude modulation (oscillator either off or operating at a fixed level) is accompanied by considerably less fm than is sinusoidal amplitude modulation.

The Type 1263 Amplitude Regulating Power Supply provides leveling of the "on" amplitude and a 50-ohm source impedance. The power output available to a 50-ohm load is adjustable from 0.2 to 20 mW, cw, or peak square wave (0.2-2 volts behind 50 ohms).

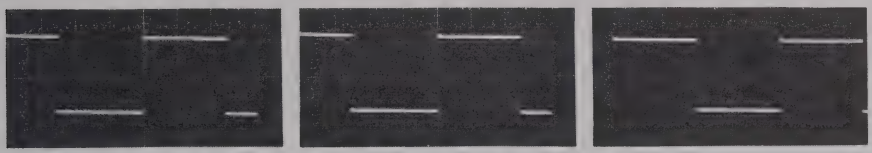
The Type 1264 Modulating Power Supply permits the oscillator to deliver full-rated cw power output and a peak square-wave power approximately twice as great. The output can be attenuated over the full range of the oscillator LEVEL control.

Figure 1-4 shows the square-wave performance of the oscillator/power supply combination. The internal 1-kHz square-wave of the Type 1264 was used and the photographs show the detected rf output of the oscillator. They were obtained using the method described in paragraph 6.3.4.

1.3.4 PULSE-AMPLITUDE MODULATION.

The rise time, starting delay, and fall time of the Type 1218-B oscillator depend on frequency and load conditions. They are, however, independent of pulse repetition rate, provided the duty ratio does not exceed 50%, at which point the oscillator plate dissipation may become excessive. Jitter remains negligible, even with pulses as narrow as 0.2 μs.

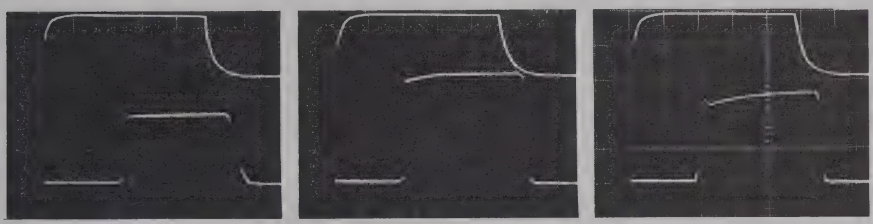
Typical performance obtained with the Type 1264 Modulating Power Supply driven by the Type 1217 Unit Pulse Generator is shown in Figures 1-5 through 1-7. The method used to obtain these waveshapes is given in paragraph 6.3.5.



900 MHz 1500 MHz 2000 MHz

Square-Wave Amplitude Modulation at 1 KHz.

Figure 1-4. Type 1218-B oscillator with Type 1264 Modulating Power Supply — square-wave amplitude modulation at 1 kHz. The detected rf voltage shown has negligible overshoot at the beginning of the "ON" half-cycle (the upper line segment). Time scale: 200 μs/major division.



900 MHz 1500 MHz 2000 MHz

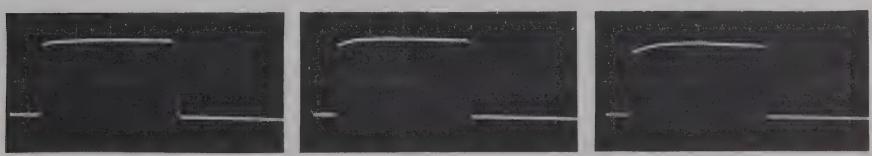
Pulse Amplitude Modulation with 2.5 μsec Command Pulses

Figure 1-5. Type 1218-B oscillator with Type 1264 Modulating Power Supply — pulse-amplitude modulation with 2.5-μs command pulses. The detected rf voltage (lower trace) shows that the start of oscillation lags about 1 μs behind the pulse driving the modulator (upper trace). The level undergoes slight changes during the first microsecond or so, and is terminated abruptly 0.3 μs after the end of the driving pulse. Time scale: 0.5 μs/major division.

900 MHz 1500 MHz 2000 MHz

Pulse Amplitude Modulation, 0.2-μsec Pulses

Figure 1-6. Type 1218-B oscillator with Type 1264 Modulating Power Supply — pulse-amplitude modulation generating 0.2-μs pulses (detected envelope). Time scale: 0.5 μs/major division.



900 MHz 1500 MHz 2000 MHz

Pulse Amplitude Modulation, 4-μsec Pulses

Figure 1-7. Type 1218-B oscillator with Type 1264 Modulating Power Supply — pulse-amplitude modulation generating 4-μs pulses (detected envelope). Time scale: 1 μs/major division.

Typically, the rf pulse starts approximately 1 μs after the input pulse to the Type 1264, while it ends approximately 0.25 μs after the end of the input pulse. Most of the delay is in the modulator. The exact shape of the initial rise and final decay of the detected pulse is a function of rf tuning. The rise-time range is about 0.1 to 0.2 μs and the decay-time range 0.1 to 0.3 μs; the longer times occur at the 900-MHz end of the tuning range. Jitter is typically well below 0.1 μs. The variation in oscillator output, as a function of radio-frequency tuning (for a fixed setting of the LEVEL control), is different for pulse-modulated operation than for cw operation. The peak rf level available is about twice the maximum cw level.

In Figure 1-5, the upper trace shows a 2.5-μs pulse delivered by the Type 1217 to the Type 1264, while the lower trace shows the detected envelope of the Type 1218-B rf pulse. The Type 1218-B LEVEL control was set to midscale and remained unchanged as the radio frequency was varied. Thus, the pulse "amplitude" in this picture gives an approximate idea of the variation in oscillator output under modulated conditions, as a function of radio-frequency tuning.

The 0.2-μs and 4-μs pulses in Figures 1-6 and 1-7 were obtained by use of the Type 1217 to drive the Type 1264 with pulses approximately 0.75 μs longer than the desired rf output pulses. At each oscillator frequency, the pulse-duration control on the generator was readjusted to give the desired rf envelope.

1.3.5 FREQUENCY MODULATION.

Some electronic control of frequency can be obtained by application of voltage between grid and cathode of the oscillator. Sweeps up to 3 MHz are attainable over part of the tuning range of the oscillator, but there is significant incidental AM, and the sweep is not linear. Jacks "G" and "K", for 0.050-inch diameter pin plugs (at the lower left-hand corner of the instrument behind the panel), permit the necessary connections to be made.*

CAUTION

The grid and cathode jacks are normally at a potential of approximately -150 volts with respect to ground.

1.4 SWEPT-FREQUENCY OPERATION.

Swept-frequency operation of the Type 1218-B is not recommended because the sliding contacts and associated cavities are subject to severe wear particularly if a motor drive is used.

*For further information, see "A Spectrum Analyzer From General Lab Instruments," by R.W.Harley, *Electronic Industries*, February, 1962. General Radio Reprint No. A-98.

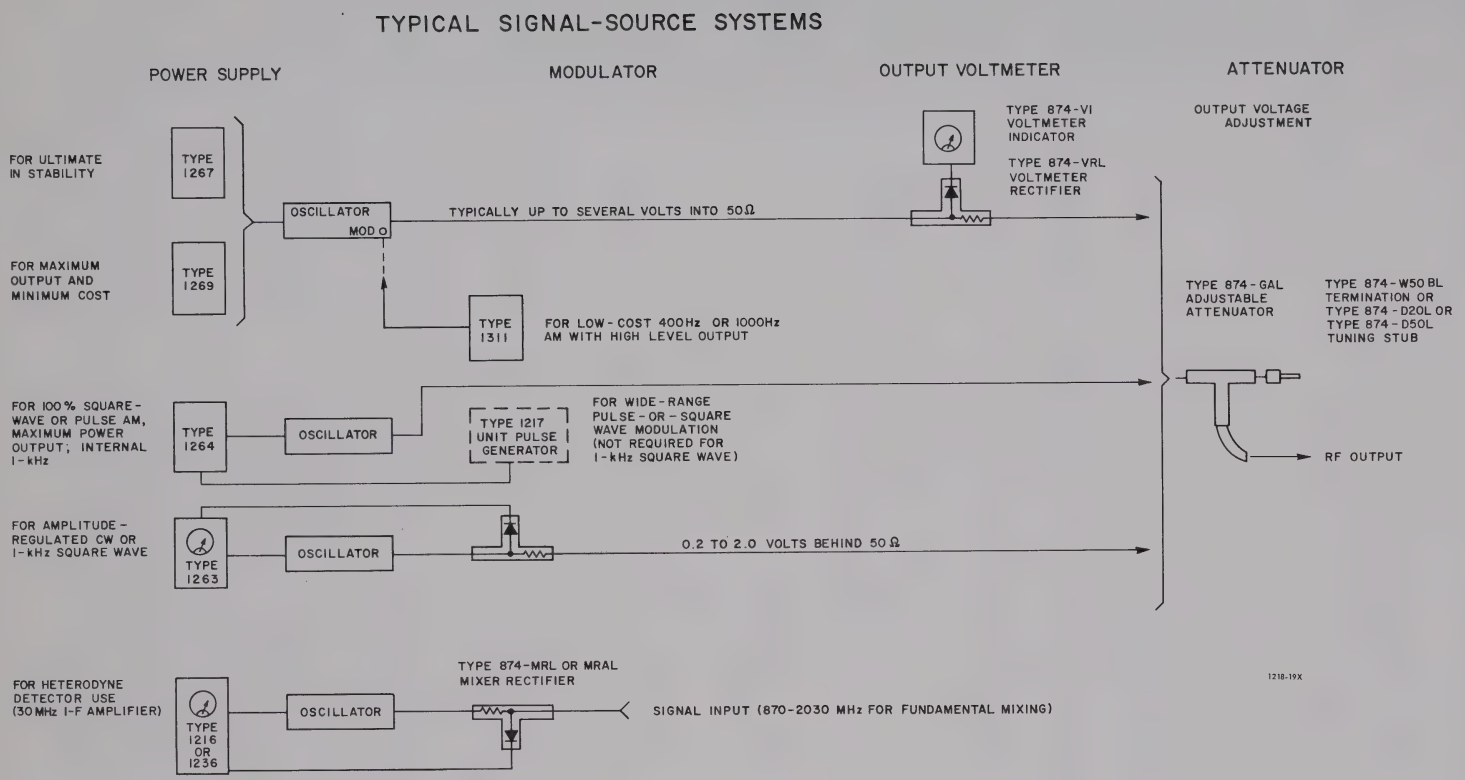

TYPICAL SIGNAL-SOURCE SYSTEMS
POWER SUPPLY
MODULATOR
OUTPUT VOLTMETER
ATTENUATOR
FOR ULTIMATE IN STABILITY
TYPE 1267
FOR MAXIMUM OUTPUT AND MINIMUM COST
TYPE 1269
OSCILLATOR
MOD O
TYPICALLY UP TO SEVERAL VOLTS INTO 50Ω
TYPE 874-VI VOLTMETER INDICATOR
TYPE 874-VRL VOLTMETER RECTIFIER
OUTPUT VOLTAGE ADJUSTMENT
TYPE 1311
FOR LOW-COST 400Hz OR 1000Hz AM WITH HIGH LEVEL OUTPUT
TYPE 874-GAL ADJUSTABLE ATTENUATOR
TYPE 874-W50BL TERMINATION OR TYPE 874-D20L OR TYPE 874-D50L TUNING STUB
FOR 100% SQUARE-WAVE OR PULSE AM, MAXIMUM POWER OUTPUT; INTERNAL 1-kHz
TYPE 1264
OSCILLATOR
TYPE 1217 UNIT PULSE GENERATOR
FOR WIDE-RANGE PULSE-OR-SQUARE WAVE MODULATION (NOT REQUIRED FOR 1-kHz SQUARE WAVE)
RF OUTPUT
FOR AMPLITUDE-REGULATED CW OR 1-kHz SQUARE WAVE
TYPE 1263
OSCILLATOR
0.2 TO 2.0 VOLTS BEHIND 50Ω
TYPE 874-MRL OR MRAL MIXER RECTIFIER
FOR HETERODYNE DETECTOR USE (30MHz I-F AMPLIFIER)
TYPE 1216 OR 1236
OSCILLATOR
SIGNAL INPUT (870-2030 MHz FOR FUNDAMENTAL MIXING)
1218-19X

Figure 1-8. Typical signal-source systems built with a unit oscillator and associated equipment.

1.5 ACCESSORIES REQUIRED.

The Type 1218-B oscillator requires an external power supply. (Refer to paragraph 1.6.)

1.6 ACCESSORIES AVAILABLE.

1.6.1 GENERAL.

Signal-source systems for a variety of specific requirements can be assembled easily with the Type 1218-B oscillator and auxiliary equipment. Typical systems are diagrammed in Figure 1-8.

Table 1-5 lists the accessories recommended for use with this oscillator. The best choice of power supply and modulator depends on the intended application, as suggested in the table.

Attachment of accessories for bench use or relay-rack mounting is shown in the accompanying sketches and described in Section 2.

CAUTION

Motorized drives should not be attached to the Type 1218-B oscillator except in special situations for limited periods (paragraph 1.4).

TABLE 1-5

ACCESSORIES AVAILABLE

Function	*Instrument*	*Remarks*
POWER SUPPLIES		
For best stability, freedom from line-voltage variations, and minimum residual fm.	Type 1267 Power Supply	Regulated dc plate and heater supplies.
For maximum output at minimum cost.	Type 1269 Power Supply	Filtered dc plate supply and ac heater supply, both unregulated.
For 100% square-wave or pulse-amplitude modulation with maximum power output and stable cw operation.	Type 1264 Modulating Power Supply	Internal 1-kHz square-wave generator.
For amplitude-regulated cw or 1 kHz square-wave modulated output.	Type 1263 Amplitude-Regulating Power Supply	Leveled output of 20 mW into 50 ohms; includes Type 874-VRL Voltmeter Rectifier.

TABLE 1-5 continued

Function	*Instrument*	*Remarks*
POWER SUPPLIES cont.		
For use as local oscillator in heterodyne detector system.	Type 1216* Unit I-F Amplifier; contains built in supply for oscillator.	30-MHz center-frequency amplifier has calibrated attenuator and output meter. Use with Type 874-MRL Mixer Rectifier.
MODULATORS		
For pulse and square-wave modulation with little incidental fm.	Type 1263 Type 1264	See listing above.
For sinusoidal plate modulation at 400 and 1000 Hz.	Type 1311 Oscillator	Provides 30% modulation.
ADAPTOR PLATE SETS		
To rack-mount the oscillator alone	Type 481-P412 Adaptor Plate Set	
To rack-mount the oscillator with a Type 1267 or 1269 power supply	Type 481-P416 Adaptor Plate Set. Panel accommodates special GR874 patch cord supplied to bring rf output to front panel.	
To rack-mount the oscillator with a Type 1263 or 1264 power supply	Type 482-P412 Adaptor Plate Set. Panel accommodates special GR874 patch cord supplied to bring rf output to front panel.	
COAXIAL ELEMENTS See table at the rear of this manual.		
To convert from GR874 to other coaxial systems	Type 874-Q Adaptors	13 series available
To reduce standing-wave ratio on transmission lines	Type 874-G Attenuators	3, 6, 10, 14 and 20 dB available
To reduce harmonic content of output from oscillator	Type 874-F 2000L Filter	low-pass
For use in a heterodyne detector system	Type 874-MRL* Mixer Rectifier	Particularly useful with Type 1216 Unit I-F Amplifier
To provide monitored output level, 50Ω	Type 874-VRL Voltmeter Rectifier	Use with Type 874-VI Voltmeter Indicator.

*Type 1236 with Type 874-MRAL recommended for wide band applications.

1.6.2 COAXIAL ADAPTORS.

The Type 1218-B oscillator uses the low-VSWR, quick-connect, GR874 coaxial connector for its rf output. A comprehensive assortment of special coaxial devices and instruments based on the GR874 50-ohm design is available to complement the oscillator (refer to Table 1-5).

For the user who wishes to mate the oscillator to components fitted with coaxial connectors of other leading coaxial series, GR874 adaptors are available to convert the OUTPUT connector to the desired type of plug or jack. Recommended jack adaptors, suitable to the frequencies involved, are listed in Table 1-6. Each of these adaptors can be locked to the oscillator for a rigid installation and to minimize rf leakage at that junction.

Table 1-6
TYPE 874 LOCKING ADAPTORS
TO OTHER SERIES

Adapts	*Type*	*Contains 874 and ...*	*Connects Type 874 to ...*	*Catalog Number*
TO AMPHENOL APC-7	874-QAP7L	APC-7	APC-7	0874-9791
TO TYPE BNC	874-QBJL	BNC jack	BNC Plug	0874-9701
TO TYPE C	874-QCJL	C jack	C Plug	0874-9703
TO TYPE MICRODOT	874-QMDJL	Microdot Jack	Microdot Plug	0874-9721
TO TYPE N	874-QNJL	N Jack	N Plug	0874-9711
TO TYPE SC	874-QSCJL	SC Jack	SC Plug(Sandia)	0874-9713
TO TYPE TNC	874-QTNJL	TNC Jack	TNC Plug	0874-9717
TO TYPE GR900	900-Q874	GR900	GR900 Precision 14-mm connector	0900-9883
TO TYPE OSM/BRM	874-QMMJL	OSM/BRM Jack	OSM/BRM Plug	0874-9723

These uniform 50-ohm adaptors offer electrical performance to match their convenience of use. A special low-VSWR design assures that the over-all VSWR of the converted GR874 connector is no greater than that of the other-series connector by itself (with the exception of the Type 900-Q874).

SECTION 2 INSTALLATION

2.1 CONNECTION TO POWER SUPPLY.

2.1.1 GENERAL.

The Type 1218-B oscillator is shipped ready for use, requiring only connection to a suitable power supply. A cable with a 5-contact plug is attached to the instrument for direct connection to the receptacle located on the right side of any of the recommended General Radio power supplies. This is the only power connection required when using Type 1267 or 1269 Power Supplies.

CAUTION

The socket chained to the shelf behind the front panel of the oscillator must be connected to the nearby eight-pin plug under the casting, except when the Type 1264 Modulating Power Supply is used.

Additional connections required with the Type 1263 or 1264 power supplies are described below.

2.1.2 CONNECTION TO TYPE 1263.

In addition to the oscillator power-cable connection, modulation and rf output connections are required. The short patch cord supplied with the power supply should be connected between the two-contact parallel-blade MODULATION plug, on the right-hand side of the power supply, and the P jack at the lower left-hand corner of the oscillator (behind the panel). Connect the Type 874-VRL Voltmeter Rectifier (furnished with the power supply) as follows:

a. Lock the short arm to the output connector of the oscillator, either directly or with a Type 874-G3L Pad between them. Padding improves the stability of the regulator so that the range of stable levels available across the full tuning range is increased about 5 dB to at least 10 dB.

b. Connect the center arm of the rectifier, via the GR874 coaxial patch cord supplied, to the OUTPUT RECTIFIER terminal on the power supply.

The remaining arm of the Type 874-VRL, marked "R", contains a 50-ohm series resistor, which is the effective generator source impedance. The leveled rf output is then available at the "R" connector of the rectifier.

2.1.3 CONNECTION TO TYPE 1264.

In addition to mating the oscillator five-contact plug with the appropriate receptacle on the power supply, the eight-contact receptacle on the end of cable coming from the power supply must be connected to the mating plug at the bottom of the oscillator. After removal from this plug, the socket attached by chain may be stowed at the lower right of the casting, above the shelf.

2.2 RF OUTPUT CONNECTIONS.

The output comes through a locking GR874 coaxial connector at the rear of the oscillator. With most power supplies (except the Type 1263, see 2.1.2 above), the output can be connected directly to other equipment with the three-foot coaxial patch cord supplied with the oscillator. For minimum leakage attach only locking Type GR874 connectors or adaptors to the r-f output, such as the connectors found on the Type 874-R22LA Patch Cord supplied, and make sure that they are always locked finger tight.

Attenuator pads can be used to protect associated equipment, if the full output (possibly as much as 0.75 W) is liable to damage it, or to reduce standing waves, if that equipment is not a good match. Without padding, cable-resonance effects may be quite pronounced, since the output coupling loop of the oscillator is not a matched source. A low-pass filter (Type 874-F2000L) may be beneficial, if the transmission of oscillator harmonics must be kept very low.

2.3 MODULATION CONNECTION.

WARNING

An open-circuited plug in either of the phone jacks will stop the oscillator and cause full power-supply voltage to appear at the terminals.

The output of a modulator (meeting the requirements given in paragraph 1.3.2) may be connected to the switching jack labeled MODULATION on the front panel or the one labeled "P" on the left.

Always connect a low impedance to the plug, such as a current meter or modulator, before inserting it. Normally, two-conductor phone plugs are used. However, a three-conductor type (with the shell connection unused) may be inserted in the front jack only; the latter type is necessary if both jacks are to be used simultaneously.

Modulation connections required by the Type 1263 and 1264 power supplies are accomplished by cable connections described in paragraphs 2.1.2 and 2.1.3.

2.4 MECHANICAL ATTACHMENT TO POWER SUPPLY.

Kits of attaching hardware (with detailed instructions) for combination of the oscillator with any of the recommended power supplies, are furnished with each power supply.

A distinguishing feature of this oscillator is a power-supply spacer supplied with the instrument to supplement the standard attachment kit. Figure 6-2 shows the spacer stored in the main casting, visible after the left-hand shield can has been removed.

The spacer should be removed from the tuner assembly and attached at the tapped hole at the lower rear of the left-hand side of the casting. The shield can must be reinstalled.

The hole in the spacer lines up with a hole in the side of the recommended power supply, when the two instruments are arranged side-by-side for attachment. The 10-32 screw furnished with the power supply should be passed through these holes and secured with the accompanying nut. This, with the L-clips used behind the front panel, makes for a rigid assembly. (See Figure 2-3.)

2.5 RACK MOUNTING.

The Type 1218-B oscillator can be mounted in standard 19-inch relay racks with adaptor kits available from General Radio. The kits permit rack mounting alone or in combination with any of the recommended power supplies. Figure 2-1 shows the oscillator racked beside a Type 1267 Power Supply. Complete installation instructions are supplied with the kits.

The rack-height requirement is exactly seven inches, except when the oscillator is combined with a Type 1263 or a Type 1264 power supply. Since these combinations exceed rack width, the instruments must be mounted separately, and will require 14 inches of rack height.

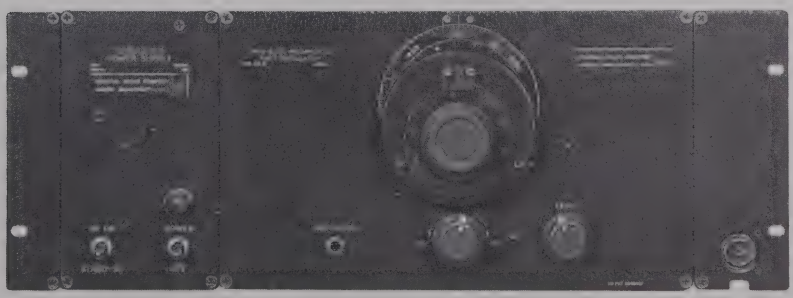


Figure 2-1. Type 1218-B7R rack-mounted rf source, typical of the wide variety of rack-mount oscillator/power-supply combinations available. A special coaxial patch cord supplied brings oscillator rf output to the GR874 connector shown at right. Rack height is 7 inches.

These supplies dissipate over 50 watts apiece and rely on air-convection cooling. The supply should be mounted above rather than below the oscillator, preferably offset left or right for optimum ventilation.

The rf output of the oscillator, normally available at the GR874 connector at the rear of the instrument, can be brought to the front panel in rack-mounted configurations. Supplied as part of the rack-adaptor kit is a GR874 patch cord fitted on one end with a locking cable connector and on the other with a recessed locking connector. The front-panel connector is shown installed at the right in Figure 2-1.

Rack-mount clearance dimensions for the Type 1218-B oscillator appear in Figure 2-2.

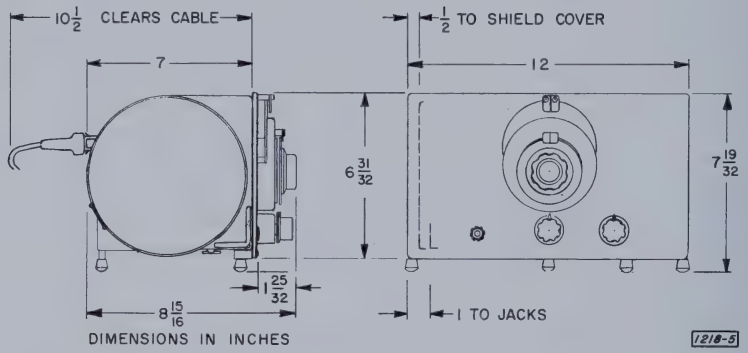


Figure 2-2. Clearance dimensions for the Type 1218-B oscillator.

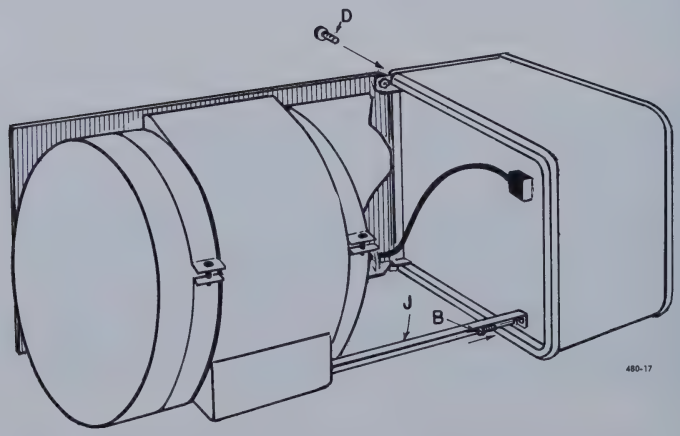


Figure 2-3. Attachment of Type 1218 to power supply.

SECTION 3 OPERATION

3.1 EQUIPMENT TURN-ON.

The power switch on any of the recommended supplies controls the application of heater power to the oscillator. On all supplies except the Type 1269 plate voltage is applied by appropriate setting of a standby or function switch. Rf output is obtainable from the oscillator about 15 seconds after power is turned on, an interval required for the heater to come up to temperature.

NOTE

For good oscillator frequency stability, allow at least one-half-hour warmup period. Refer to paragraph 1.2.4.

3.2 FREQUENCY ADJUSTMENT.

The calibration accuracy of the frequency dial is ±1%, but the frequency can be reset by use of the logging scales to a precision of 1 MHz at midscale. This precision increases to 0.7 MHz at the low end and falls off to 3.3 MHz at the high end. By interpolation within the 1/8-inch interval between the vernier-scale marks, the precision of the setting can be increased by a factor of at least two, to ±.05% at midscale.

The inner scale on the main frequency-control dial serves as the first digit in a three-digit logging scale, the last two digits being indicated by the vernier dial. The 0 mark on the vernier corresponds to any one of the lines separating the nine numbered segments, 0 through 8. Combined, the dials furnish over 800 dial settings throughout the range of the oscillator, to permit rapid and precisely repeatable frequency settings.

The mesh of the main- and vernier-dial drive gears is maintained by a spring return, which automatically disengages the drive if the tuning mechanism hits a stop. To restore proper mesh, rotate the main dial to an intersegment mark, lift up gently on the knob, and reset the vernier 0 mark.

CAUTION

Type 1218-B oscillator includes sliding contacts which may wear excessively if operated by a motorized drive; therefore, only hand tuning is recommended.

Finer control of frequency can be achieved with the ΔF control, which can raise or lower the frequency by CCW or CW rotation ≈300° from neutral setting. Therefore, for precise settings with the main frequency or logging scales, the ΔF pointer must be at neutral. The total range of ΔF adjustment is approximately 0.1%, with resolution on the order of 0.3 part per million.

3.3 LEVEL CONTROL.

To vary the amplitude (from essentially zero to maximum), rotate the LEVEL control (clockwise for increase). When the frequency is near 2000 MHz, maximum amplitude may occur slightly before full clockwise rotation. Settings as low as 20 dB below full output can be made with this control.

To make the signal level more nearly constant as frequency is changed, reduce the level control somewhat below its maximum, or insert a pad (or isolator) in the output circuit, or do both. However, such measures cannot match the excellent automatic leveling obtained by use of the Type 1263 Amplitude-Regulating Power Supply (paragraph 1.3.3).

SECTION 4 APPLICATIONS

4.1 GENERAL.

The versatility of the Type 1218-B Oscillator is greatly increased by the large selection of GR874 Coaxial Elements available from General Radio Company. These elements are part of a complete, integrated line of equipment for measurement of voltage, impedance, and standing-wave ratio at very-high and ultra-high frequencies. Use of the coaxial elements can adapt the oscillator to various applications in the radio-frequency laboratory.

Five applications are described in detail in the following paragraphs. Others will be suggested by a study of the complete list of GR874 coaxial elements included in the General Radio catalog. Coaxial elements with locking connectors are preferred. A condensed list of Type 874 elements appears at the back of this manual.

4.2 IMMITTANCE MEASUREMENTS (ONE PORT).

For the measurement of the admittance or impedance of one-port networks, one Type 1218-B oscillator can be used as the primary source of cw, rf power, and another as the local oscillator in the associated heterodyne detector. The Type 1602 UHF Admittance Meter is the central instrument in the setup depicted in Figure 4-1. This is a null instrument in the GR874 coaxial line size, useful for rapid, direct-reading measurements of complex Z or Y on one-port rf devices at frequencies up to 1500 MHz.

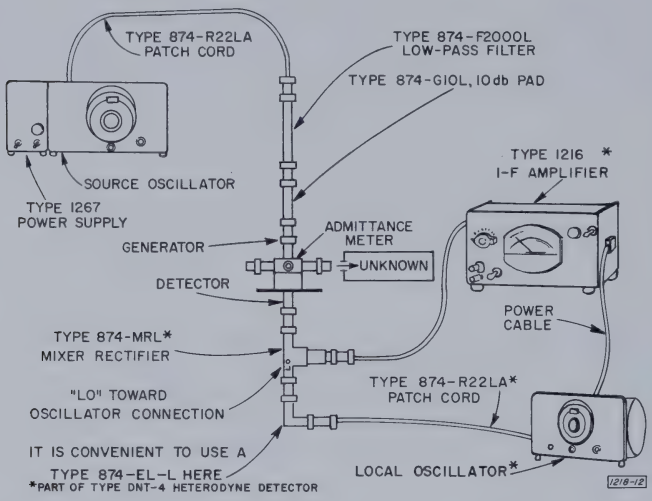


Figure 4-1. Immittance measurement setup utilizing the Type 1218-B with the Type 1602 UHF Admittance Meter.

The heterodyne detector assembly is designated as the Type DNT-4 Detector system. Note that the Type 1216 Unit I-F Amplifier contains two internal power supplies, one for its own use and a spare to provide power (without regulation) for the oscillator. However, the Type 1267 Regulated Power Supply is ideally suited to power the Type 1218-B in this or any other cw application.

For impedance and VSWR measurements with slotted lines (such as the Type 874-LBB or the Type 900-LB precision line) the Type 1218-B oscillator with the Type 1264 Modulating Power Supply is an excellent rf source. Figure 4-2 shows the set-up; square-wave, 1-kHz modulation is used. Detection of the rf signal takes place in the probe carriage and the "standing-wave indicator" is a sensitive voltmeter tuned to 1 kHz.

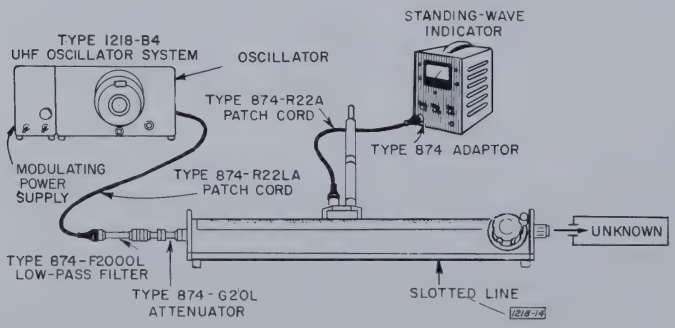


Figure 4-2. Use of Type 1218-B4 system to drive a slotted line for VSWR measurements.

4.3 TRANSFER-FUNCTION MEASUREMENTS (TWO-PORTS).

For measurement of transfer functions of multiport devices, one Type 1218-B can be used as the primary source of rf power and another as the local oscillator in the associated heterodyne detector.

The equipment setup shown in Figure 4-3 is built around the Type 1607 Transfer Function and Immittance Bridge, uniquely used to measure parameters of two-port rf devices, up to 1500 MHz. Its most frequent application is the dynamic measurement of admittance parameters of high-frequency transistors. The Type 1607 is also a null instrument, direct reading in immittance values, and equipped with GR874 connectors. Refer to paragraph 4.2.

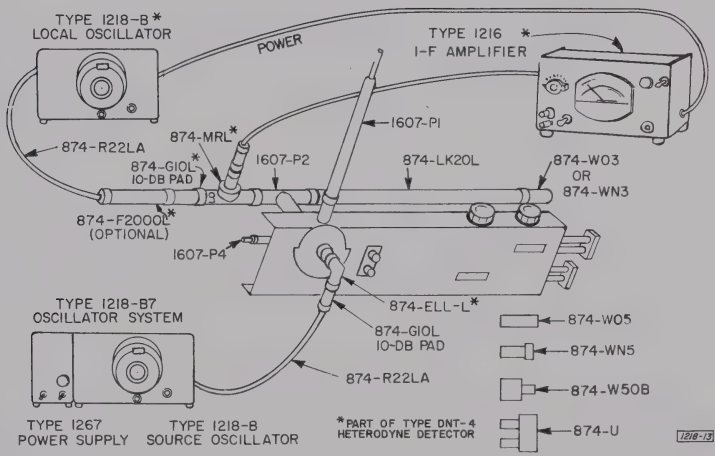


Figure 4-3. Transfer-function measurement setup utilizing the Type 1218-B oscillator with the Type 1607 bridge.

4.4 INSERTION-LOSS MEASUREMENTS.

The Type 1218-B, a well-shielded power source, can be used as a signal generator to perform insertion-loss or attenuation measurements, if means are available to measure its output and provide calibrated attenuation.

Instrumentation for these measurements, with the oscillator modulated at 1-kHz, is displayed in Figure 4-4. The Type 874-VRL Voltmeter Rectifier and the Type 874-VI Voltmeter Indicator are suitable for level measurement, and the Type 874-GAL Adjustable Attenuator can control the level by known amounts.

If the network under test has a large attenuation factor, a more sensitive detector may be needed, such as the Type DNT-4 Heterodyne Detector shown in Figure 4-1. In such a case, the oscillator can be operated without modulation.

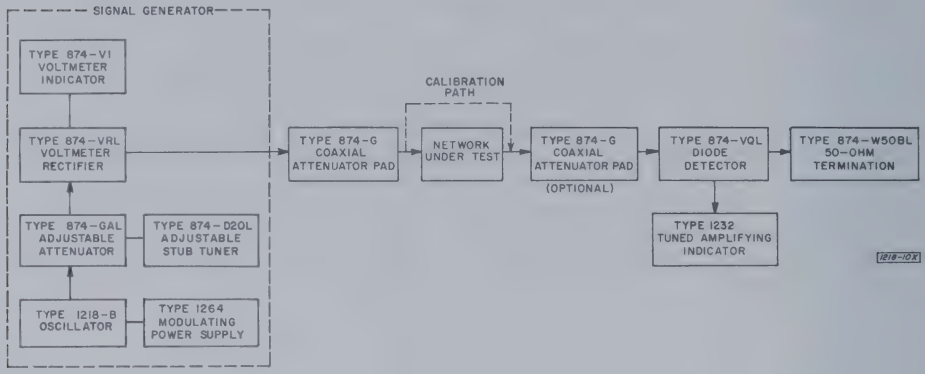


Figure 4-4. Sensitive insertion-loss test setup incorporating the Type 1218-B oscillator.

With the above-described arrangement, the maximum available signal at the network under test is about +4 dBm; the attenuator calibration covers 120 dB. Shielding of the oscillator and of other components is adequate for accurate measurements over about half of this range.

4.5 FREQUENCY CONVERSION.

Connected to a Type 874-MRL Mixer Rectifier, the Type 1218-B can provide the local-oscillator signal in a heterodyne converter. Without additional tuning, conversion loss is about 6 dB at an intermediate frequency of 30 MHz. At that frequency, the Type 1216 I-F Amplifier has excellent sensitivity, high gain, and a bandwidth of 0.7 MHz. Signal levels are indicated by a panel meter and a built-in precision attenuator. Provision is made in this i-f amplifier for the measurement of the rectified mixer current and a separate built-in supply is available to power the oscillator. Examples of this application appear in Figures 4-1 and 4-3.

4.6 USE AS A TRANSFER OSCILLATOR.

The Type 1218-B can be used as a transfer oscillator to measure the frequency of a microwave source, or as a heterodyne frequency meter of limited accuracy.

Auxiliary equipment required, in addition to a power supply, includes a Type 1232 Amplifier (broadband), a Type 874-VRL Voltmeter Rectifier, a Type 874-G20L pad, a Type 874-R34 patch cord, and two patch cords (such as Type 874-R22LA) for connection to the signal source. The necessary connections are shown in Figure 4-5. Headphones may be useful.

The oscillator should be tuned to zero beat with the source, at two or more points on the dial, and the frequencies of a pair of successive, strong beats noted. The harmonic order can then be determined as follows:

Let: f_s = the source frequency, "unknown"

f_h = the higher frequency of two successive, strong beats

f_ℓ = the lower frequency of two successive, strong beats

$f_d = f_h - f_\ell$ = the difference between these two frequencies

$H = f_h/f_d$ (always an integer)

and the source frequency, f_s, is:

$$f_s = Hf_\ell = (H-1)\, f_h$$

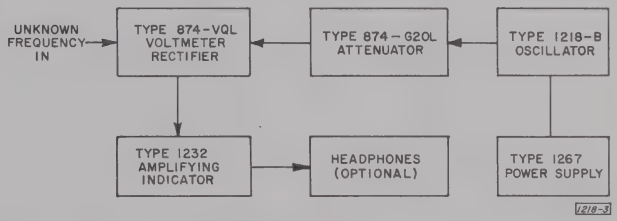


Figure 4-5.
Setup for frequency measurement, using a Type 1218-B oscillator and accessories.

SECTION 5 PRINCIPLES OF OPERATION

5.1 GENERAL.

The Type 1218-B oscillator is a vacuum-tube oscillator intended for use as a general-purpose laboratory rf source. Its frequency range, which extends from 900 to 2000 MHz, is tunable with a single control, without need for band switching. Frequency setting is indicated on a large, easy-to-read, machine-engraved dial, individually calibrated to give ±1% accuracy.

The oscillator is capable of delivering rf power in excess of 130 milliwatts over its frequency range. Power-supply, modulation and output-calibration circuitry have been omitted from the instrument, in order to leave the user the greatest possible latitude of choice to arrange the oscillator in a system that meets his particular needs. A full range of accessory devices and instruments available permits final use of the Type 1218-B as a simple cw-signal source or as an instrument approaching signal-generator quality.

5.2 CIRCUITRY.

5.2.1 GENERAL.

The oscillator uses a triode in the tuned-plate-tuned-cathode circuit shown in the elementary diagram in Figure 5-1. (Refer to Figure 6-7 for the complete schematic.) The rf circuit is of the grounded-grid configuration, but the plate is at ground potential for dc. Feedback is accomplished through the internal plate-cathode tube capacitance.

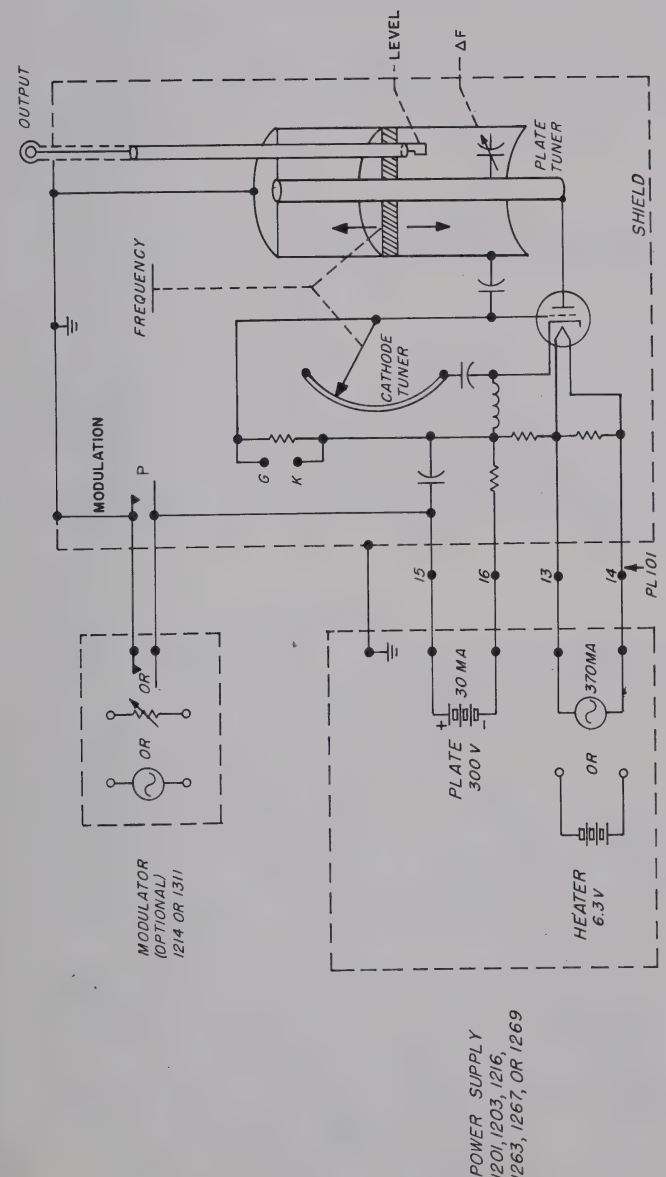


Figure 5-1. Simplified schematic diagram of the Type 1218-B Unit Oscillator applicable to CW operation or amplitude modulation except for that applied through the cathode circuit.

5.2.2 TUBE.

The oscillator tube used is the 5675-type pencil triode. This tube has small internal electrodes of conventional cylindrical design, but disk-seal construction provides low-inductance connections suitable for use in coaxial circuits. Tuning between plate and grid is possible, with a quarter-wave line section, to frequencies above 2000 MHz. Because of grid-cathode capacitance in the tube, a 3/4 wavelength section is required to tune the cathode circuit.

5.2.3 TUNING ELEMENTS.

The high-Q, quarter-wavelength plate line largely determines the frequency of oscillation. The longer, lower-Q, three-quarter-wave cathode line must be tuned to the same frequency for oscillation to occur. The higher the frequency, the more precisely the cathode line must be tuned.

Because the cathode line is so long, a unique, space-saving trough-line design is used (see Figure 5-2). The line is curled so that the inner conductor takes the form of a toroid with square cross section (having about one-quarter cut away). The outer conductor is a hollow toroid with rectangular cross section. The inner wall of the outer conductor is actually the hub of the tuning rotor, which supports and drives sliding contacts on the plane faces of both conductors. Dielectric supports for the inner conductor are fastened along the outer wall.

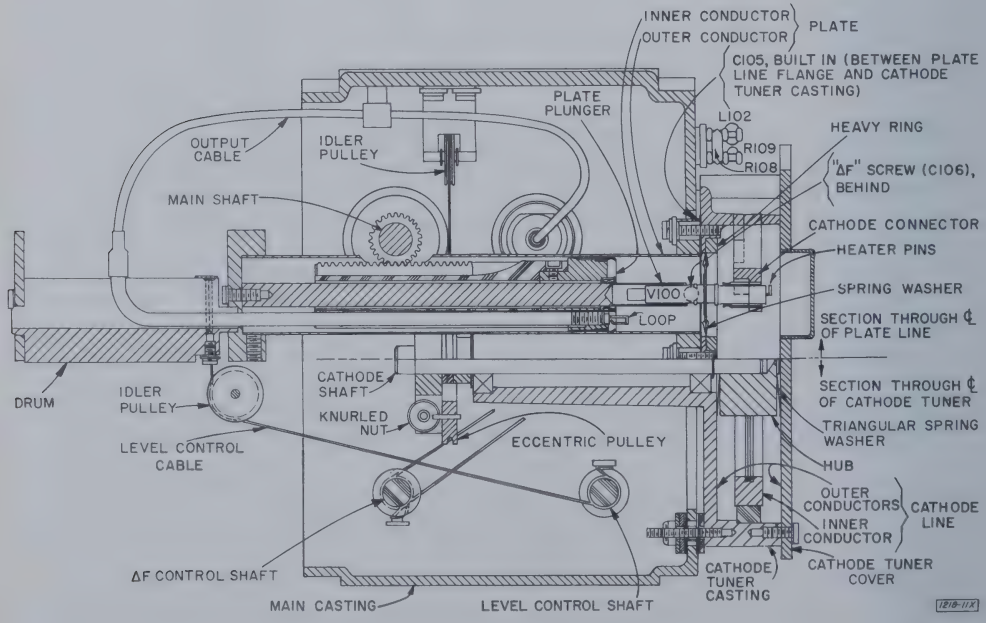


Figure 5-2. Cross-section view of Type 1218-B oscillator tuning structure.

The inactive portion of the cathode line (beyond the shorting contacts) is terminated by R110 and R111, to suppress parasitic resonances which could otherwise cause "suckouts", or holes, in the power-vs-frequency characteristic.

Although the rf circuit is a grounded-grid type, the plate and its tuner are at dc ground potential. The grid is bypassed to ground through a special capacitor, C105. It is formed with a mica ring between the mounting flange on the plate line and its seat on the cathode-tuner casting, near the grid flange of the tube.

The plate line is driven directly from the main dial shaft by means of a rack and pinion, while the cathode line is coupled to the dial shaft by means of a low-backlash cable drive, which includes an adjustable cam to permit proper tracking adjustment.

5.2.4 FINE TUNING.

Fine tuning over approximately 2 MHz is accomplished by C106, a capacitive probe which enters the plate tuner near the tube and has an adjustable depth of penetration. A front-panel control, which can be rotated approximately 300° on either side of a neutral setting (knob pointer up), drives the probe through a flexible cord and pulley. Clockwise rotation decreases frequency by increasing probe penetration. This control has a negligible effect on tube current and, therefore, on thermal equilibrium and frequency stability.

5.2.5 OUTPUT COUPLING.

Output level is controlled by rotation of the output coupling loop, L101. Because the plate line is at dc ground potential, it is practical to mount the loop on the plate tuning plunger, always in the zone of highest rf-magnetic-field intensity, at the shorted end of the resonator.

The LEVEL control is linked, through a cord-and-pulley arrangement, to a slotted drum which rotates the loop 90° for 200° of knob action. The useful range of output level control is about 20 dB, including full power at or near the clockwise stop.

5.2.6 POWER CIRCUITS.

The Type 1218-B works best from a 300-volt power supply, with about one half this voltage on the plate of the oscillator tube. The large series resistor (R100) required for this operation helps to stabilize the oscillator and protect the tube from overloads. Capacitor C100, in conjunction with this resistor, provides extra filtering of any ripple voltage on the plate supply. To avoid complications in the rf output circuit, the B supply is grounded at the plate potential of the oscillator tube. To reduce undesirable fm, when commonly available 6.3-volt, ac heater power is used, the cathode circuit is isolated from the heater.

5.2.7 MODULATION AND LEVELING.

The plate circuit can be opened at the ground point, at a panel jack or at a behind-the-panel jack. Audio voltage can be applied here to obtain

sinusoidal or more complex amplitude modulation, or a control voltage can be inserted in series with the plate voltage to provide leveling.

The connections for these purposes are described in paragraph 2.3.

5.2.8 PULSE-MODULATION CIRCUITS.

A diode-resistor network is included to permit grid pulsing of the oscillator by the Type 1264 Modulating Power Supply, which acts primarily through the cathode circuit. This technique permits short rise and decay times in the rf pulse envelope (see Figures 1-5 through 1-7). The simplified diagram of Figure 5-3 shows the essential elements in this mode of operation.

Basically, the modulator tube V_A switches the oscillator on and off. The use of grid modulation avoids the necessity of charging C105 to the full operating potential of the tube from a discharged condition, and thereby hastens the turn-on of the oscillator.

In the "off" condition, current flows from B+ to B- through R106, R103, and the Zener diode, CR101, which clamps the grid potential. The bias developed across R103 is sufficient to cut off conduction in the tube and prevent oscillation. Diode CR103, in series with the modulator, permits the bias conditions to be established entirely by R103, R106, and the Zener diode. This allows the potential at pin 7 to rise freely during the "off" period, as required by the internal circuitry (particularly V_B) of the modulator.

In the "on" condition, modulator tube V_A conducts heavily, bringing the potential at pin 7 slightly below that previously existing at the grid, thereby cutting off current previously flowing through CR101 and absorbing all the current flowing through R106. The cut-off bias previously developed across R103 is no longer present and this resistor now functions as a normal grid leak. CR102 assists in charging C105 rapidly.

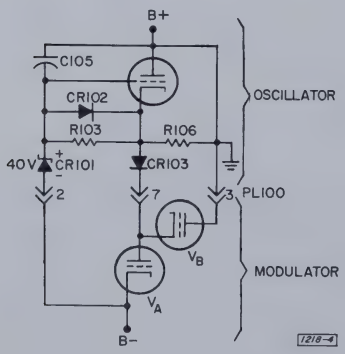


Figure 5-3. Simplified schematic of oscillator operation with modulation through the cathode circuit.

SECTION 6

SERVICE AND MAINTENANCE

6.1 WARRANTY.

We warrant that each new instrument sold by us is free from defects in material and workmanship, and that, properly used, it will perform in full accordance with applicable specifications for a period of two years after original shipment. Any instrument or component that is found within the two-year period not to meet these standards after examination by our factory, district office, or authorized repair agency personnel, will be repaired, or, at our option, replaced without charge, except for tubes or batteries that have given normal service. Normal life of the type-5675 tube is considered to be 400 hours or 6 months; replacements for defective tubes will be made on a prorated basis within this period.

6.2 SERVICE.

The two-year warranty stated above attests the quality of materials and workmanship in our products. When difficulties do occur, our service engineers will assist in any way possible. If the difficulty cannot be eliminated by use of the following service instructions, please write or phone our Service Department (see rear cover), giving full information of the trouble and of steps taken to remedy it. Be sure to mention the serial and type numbers of the instrument.

Before returning an instrument to General Radio for service, please write to our Service Department or nearest district office, requesting a Returned Material Tag. Use of this tag will ensure proper handling and identification. For instruments not covered by the warranty, a purchase order should be forwarded to avoid unnecessary delay.

6.3 PERFORMANCE EVALUATION.

6.3.1 GENERAL.

The following paragraphs contain necessary information on means to determine rapidly that the oscillator is performing within specifications. The procedures given will be useful to instrument-standards laboratories and equivalently equipped service facilities, to perform routine calibration checks on properly functioning instruments and to determine that a repaired instrument has been restored to proper operation. The procedures that follow immediately apply to bench checks that use only front-panel controls and externally available test points—instrument disassembly is neither required nor recommended.

A list of recommended test equipment appears in Table 6-1 and the arrangement of that equipment for the various procedures is diagrammed in Figure 6-1. Use of a recommended General Radio power supply is presumed in all procedures (refer to paragraph 1.6).

Should the oscillator fail to meet performance specifications, return it to General Radio (as provided in paragraph 6.2) or refer to paragraph 6.4 for subsequent trouble-analysis procedures.

6.3.2 FREQUENCY CALIBRATION.

One method of determining that the calibration of the main tuning dial is within the specified ±1% accuracy is to compare the oscillator rf output with the harmonically related output of another signal source. The signals are combined in a broadband crystal detector and the resultant output is observed on a sensitive null detector serving as a beat indicator. Refer to Figure 6-1 for the test set-up and proceed as follows:

a. Connect the oscillator to the power supply, apply power, and allow for at least one-half hour warm-up. The oscillator should be unmodulated.

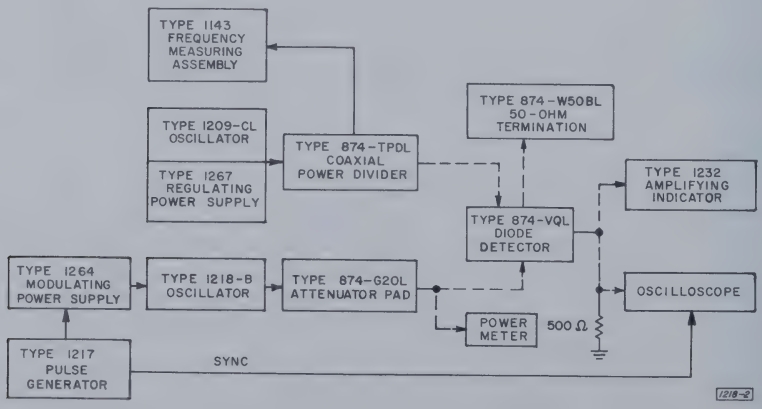


Figure 6-1. Recommended equipment setups for performance evaluation of the Type 1218-B oscillator.

Table 6-1
RECOMMENDED LIST OF TEST EQUIPMENT
(See Figure 6-1)

Type (or equivalent)	*Name*	*Function*
1264	Modulating Power Supply	Power and modulate oscillator for frequency, output, and modulation measurements.
1209-CL	Oscillator 180 to 600 MHz	Furnish strong reference signal to measure oscillator frequency.
1267	Power Supply (Regulated)	For Type 1209-CL Oscillator.
1143	Frequency Measuring Assembly-dc to 500 MHz	Furnish digital indication of signal-source output frequency.
874-VQL	Coaxial Crystal Detector	Used to generate harmonics of reference signal and mix these with oscillator output measurements; also used to detect the rf envelope in modulation and noise measurements.
1232	Null Detector - tunable to 1-kHz—1 μV sensitivity	Null indicator for frequency measurements.
874-G20L	Coaxial Attenuator Pad 20 dB	Reduce oscillator output to protect sensitive measuring instruments.
1217	Unit Pulse Generator	Drive modulator for pulse tests.
-	Oscilloscope - general-purpose, laboratory-quality	Observe modulation waveform and indications in oscillator output.
-	Voltohmeter 20 kΩ/V minimum	Measure voltage and resistance values.
-	Microwave power meter—±3% accuracy	Measure rf power output of oscillator.
874-W50BL	Termination, 50-ohm	Terminate rf system for noise and modulated - output measurements.
874-TPDL	Power Divider	Means of balanced coaxial interconnection.

b. Apply power to the signal source and allow for at least one-half hour warm-up. It should also be unmodulated.

c. Apply power to the Type 1143 Frequency Measuring Assembly and allow for one-half hour warmup, minimum.

d. Set the output loop of the Type 1209-CL oscillator about one-half inch from maximum coupling and tune carefully to 250 MHz. Observe the frequency indication on the Type 1143 and adjust the oscillator, as necessary, for at least one significant figure after the decimal point, i.e., 250 ± 0.1 MHz.

e. Turn on the Type 1232 Detector, set its amplifier in the FLAT (broadband) mode, its meter for LOG indication, and its GAIN control for negligible response (1 division on the meter).

f. Keep the LEVEL control on the Type 1218-B at a low setting (pointer up or to the left) for minimum loading effect on its frequency. Turn the mode switch on the Type 1264 power supply to CW.

g. Set the ΔF control of the Type 1218-B at neutral (with the knob pointing up) adjust the main tuning dial slowly around 1000 MHz, and look for a beat indication (peak response) on the Type 1232. The beat should occur well within ±1%.

h. Repeat the procedures of step d at 1500 MHz and at 2000 MHz, preferably using 375 and 500 MHz, respectively. If the Type 1218-B dial is correct at these frequencies, it is quite reasonable to assume that the intervening engraved lines are accurate to the specified ±1%.

i. To check the performance of the ΔF control at any of the above frequencies, measure the frequency at the ΔF stops by readjustment of the Type 1209-CL oscillator for a new audio beat and observation of the frequencies on the Type 1143-A digital readout. The ΔF range is four times the difference in the digital readings, if the ratio recommended in steps d and h is used.

If oscillator frequency calibration is outside specification, refer to paragraph 6.10 for corrective action.

The vernier dial, which has an arbitrary scale, can be reset at any time for the convenience of the user; refer to paragraphs 3.2 and 6.11 for normal setting.

6.3.3 POWER OUTPUT.

The unmodulated rf power output of the Type 1218-B can be checked with the equipment set up shown in Figure 6-1, with the microwave power meter connected directly to the Type 874-G20L pad at the oscillator output, in place of the frequency-measuring equipment. Any of the recommended power supplies may be used. (For greater accuracy the 20-dB pad may be replaced by two 10-dB pads, Type 874-G10L.)

The performance should equal or exceed the "Guaranteed" level shown in the specifications section at the front of the book. The frequency indication of the tuning control is presumed to have been checked previously (paragraph 6.3.2).

NOTE

In evaluation of output performance, allow for the pad and for the power supply used.

The procedure is as follows:

a. Connect the oscillator to the power supply (turned off) and the bolometer or thermistor mount to the output end of the Type 874-G20L Attenuator. (Refer to the table at the back of this manual for available coaxial adaptors from the GR874 connector, if necessary.)

b. Connect the mount to the power meter, set the Type 1218-B LEVEL control to minimum, and set the power supply for unmodulated operation.

c. Apply power to the instruments and allow for one-half hour warm-up time. Set the power meter for 30 mW full-scale range.

d. Set the Type 1218-B frequency to 2000 MHz and increase the LEVEL control until a maximum reading of the power meter is observed. Leave the LEVEL control in this position and tune slowly down to 900 MHz.

At any test frequency, the range of the LEVEL control can be checked if it is turned slowly down to minimum. Typically, the meter indication should decrease at least 20 dB between maximum and minimum positions.

6.3.4 SQUARE-WAVE MODULATION.

The performance of the oscillator, operated with the Type 1264 Modulating Power Supply in its 1-kHz square-wave mode, can be observed with the test setup shown in Figure 6-1. However, a general-purpose, laboratory-quality oscilloscope is the only necessary indicating instrument; the frequency-measuring equipment and pulse generator can be excluded.

The procedure is as follows:

a. Set the controls on the Type 1264 as follows:

Function---------STANDBY (temporarily)
1 KC DUTY RATIO------centered
MODULATED AMPLITUDE------fully clockwise
CW AMPLITUDE-------any setting
1 KC ΔFREQ--------centered

b. Set the LEVEL control on the Type 1218-B to 3/4 clockwise and the main tuning control to 900 MHz. Apply power and allow one-half hour for warm-up.

c. Terminate the output arm of the Type 874-VQL Detector in a Type 874-W50BL.

d. Set the Type 1264 power supply to square-wave operation and adjust the oscilloscope for a multiple pattern ($\approx$200 μs/cm sweep), to show the detected rf output.

e. Compare the modulation pattern with the typical (but not guaranteed) performance shown in Figure 1-4.

f. Repeat the procedure at 1500 and 2000 MHz.

If the waveshapes vary greatly from those shown, isolate the source of trouble between the oscillator and the power supply. If the oscillator is defective, refer to paragraph 6.4 for trouble-analysis procedures.

6.3.5 PULSE MODULATION.

The procedure to check pulse modulation is identical to that for square-wave modulation, except that a "faster" oscilloscope and the use of the Type 1217 Unit Pulse Generator are required. The latter should be set to provide 20-volt positive pulses of the desired rate and width to drive the

Type 1264 Modulating Power Supply. The repetition rate is not significant, provided only that it is low enough to give the oscillator as much time OFF as ON, to avoid over-heating the oscillator tube. The function switch on the power supply should be set to EXTERNAL. The oscilloscope sweep should trigger from the Type 1217 sync output. (The low-impedance shunt at the scope input is essential to reduce the time-constant associated with the capacitance in the video output of the Type 874-VQL.) Typical (not guaranteed) performance is shown in Figures 1-5, 1-6, and 1-7.

6.3.6 NOISE MEASUREMENTS.

Motion of the sliding contacts used in the tuning mechanism of the Type 1218-B oscillator inevitably causes random changes in level that may be quite abrupt and appear as noise spikes in the rf output, while the oscillator is being tuned. If this noise exceeds an arbitrary level, it may interfere with operation of measuring systems in which the oscillator is used. For evaluation, the same setup as in paragraph 6.3.4 can be used.

The procedure is as follows:

a. Set the scope for dc-coupled vertical presentation and a slow horizontal sweep.

b. Warmup the oscillator in the cw mode at 900 MHz for at least two minutes.

c. Switch the power supply back and forth between STANDBY and CW, and adjust the CW AMPLITUDE and LEVEL controls to calibrate the oscilloscope, so that a known vertical deflection corresponds to full oscillator output.

d. Switch the power supply to cw operation and slowly sweep the oscillator tuning from 900 MHz upward; rock back and forth in any region desired. Any noise spikes evident should not exceed 30% momentary increase, or decrease, in rf level.

Because the rf level normally varies with tuning, the calibration of step c will be valid for a limited sweep of the dial and may be repeated at other frequencies near regions of interest. Because noise spikes are sometimes caused by dirt, which may be dislodged by operation of the sliding contacts, rocking of the tuning control through a noisy region may be benefincial.

If noise spikes exceed 30% the trouble is probably in the cathode tuner; refer to paragraph 6.7 for suggested corrective action.

6.4 TROUBLE ANALYSIS.

6.4.1 GENERAL.

If the Type 1218-B oscillator performs outside of specification, as determined by procedures of paragraph 6.3, the procedures below can be used to isolate the trouble to a defective assembly or part. Comprehensive suggestions for trouble analysis are given in Tables 6-2 and 6-3. The former summarizes operating parameters, the latter cold resistances. Instructions for repair and adjustment of misaligned assemblies or defective parts are given in subsequent paragraphs.

Table 6-2

CURRENT AND VOLTAGE ANALYSIS

CAUTION: Nearly all parts under the right hand shield, can, including the cathode-tuner casting, run 100 to 300 volts negative with respect to ground.

PART 1. Power supply: Type 1267 or Type 1264 set to CW. Steps a - e.

Step	*Measurement (by use of)*	*Test Points*	*Indication*	*Comment*
a	Plate current (50-mA dc meter and phone plug)	MODULATION jack on panel	0 mA	Skip step b.
			20-35 mA— varying with tuning	Normal; output system may be damaged.
			20-40 mA— fixed when tuned	No oscillation. Cathode tuner may not be tracked to plate tuner, tube may be "weak", or grid circuit defective.
			≈40 mA	Tube short circuit: cathode- or grid-to-plate; check resistance (Table 6-3).
b	Grid voltage (50-Vdc meter and .050-inch-dia. pin plugs)	Pin jacks G (-) and K (+) at left side (Fig 6-2)	0 Vdc (regardless of dial position)	No oscillation.
			1-15 volts- (varying with tuning)	Normal.
c	Plate voltage (300-Vdc meter, clip leads and .050-inch-dia. pin plug)	"Ground" or main casting (+), jack K (-) (Fig 6-2)	0 Vdc	Power supply or cable failure, or break in circuit through phone jacks, SO100/PL100, and series resistors (Figure 6-7).
			≈14 Vdc	Plate-cathode short circuit. Replace tube; refer to paragraph 6.6.

Table 6-2 continued

Step	Measurement (by use of)	Test Points	Indication	Comment
			0-100 Vdc	C100 breakdown (Figure 6-4).
			100-200 Vdc	Normal; tube is conducting.
			≈300 Vdc	Plate supply adequate but tube not conducting. Heater may be cold; refer to step d.
d	Heater voltage (10-Vac or dc meter, depending on power supply in use; clip leads.)	C102-C103 (outside casting) (Fig 6-3)	0 V	Power-supply or cable failure; possibly a short circuit.
			≈6.3 V	Normal. If plate current zero and plate voltage high, proceed to resistance checks of heater circuit, Table 6-3, or step e.
e		Tube pins at SO102-SO103 (Fig 6-3)	0 V	Open circuit in wiring, if "normal" per step d.
			6.3 V	Normal. If glow is not seen through heater pin seal, and no heat is generated in tube, its heater is open. Replace tube—refer to paragraph 6.6.

PART 2. Power supply: Type 1264-A set to EXT but without EXT INPUT signal; MOD. AMPL. clockwise. Oscillator tuned to 1000 MHz, LEVEL max., 50-Ω load. Steps f - i.

f	Voltages in OFF condition between pulses (+ terminal of meter grounded)	Jack K to gnd (+) (Fig 6-2)	180 Vdc	Normal.
			<140 Vdc	Faulty diode CR103 (Fig 6-4).
g		Jack G to gnd (+)	200 Vdc	Normal. Note: Bias (Step g vs step f) = 20 ± 5V.
h		PL100 pin 2 to gnd (+) (Fig 6-4)	250 Vdc	Normal. Note: Reference voltage (step h vs step g = 47 ± 5V; otherwise, CR101 not functioning (Fig 6-4).
i		PL100 pin 7 to gnd (+)	27 Vdc	Normal. Depends on power supply.

Table 6-3
RESISTANCE ANALYSIS
(See Notes below table)

Step	*Measurement*	*Test Points*	*Indication*	*Comment*
a	Heater, R102 (Fig 6-3)	PL101; pins 13 and 14 (Fig 6-4)	5-10 Ω	Normal.
			27 Ω	Heater of tube open, or open circuit in cathode tuner.
b	Heater; cathode ("dummy" SO100)	PL101 pin 13; jack K (Fig 6-4,6-2)	<100 kΩ	Short circuit.
			1 MΩ	Normal.
c	Plate circuit.	Gnd.(main casting); PL101 pin 15 (Fig 6-4)	∞ Ω	Open circuit: J100, J101, SO100.
			0 Ω	Normal.
d	Line filter and plate-to-cathode	Gnd.(+); jack K	<18 kΩ	C100 faulty (Fig 6-4).
			21 kΩ	Normal.
		(Allow time for capacitor charge.)	>25 kΩ	R106 open (Fig 6-4).
e	Plate-to-grid	Gnd.(+); jack G (Fig 6-2)	0 Ω	C105 shorted (Fig 6-6).
			23 kΩ	Normal.
			>27 kΩ	R103 open (Fig 6-3).
f	Zener diode, CR101	Jack G (+); PL100 pin 2	>3 MΩ	Normal.
			otherwise	CR101 faulty.
		Jack G (-); PL100 pin 2	<3 kΩ	Normal.
			otherwise	CR101 faulty.
g	Speed-up diode, CR102	Jack K (+); jack G (-)	<1.5 kΩ	CR102 or C104 faulty (Fig 6-3).
			1.7 kΩ	Normal.
		Jack K (-); jack G (+)	300 Ω	Normal.
			no change	CR102 faulty.

Table 6-3 continued

Step	*Measurement*	*Test Points*	*Indication*	*Comment*
h	Blocking diode, CR103	Jack K(-); PL100 pin 7(+) (Fig 6-4)	<24 kΩ	CR103 faulty (Fig 6-4)
			27 kΩ	Normal
		Jack (+) pin 7 (-)	250 Ω	Normal
			No change	CR103 faulty
i	Cathode circuit	Jack K; AT4 (Fig 6-3)	320 Ω	Normal
		Jack K; PL101 pin 16 (Fig 6-4)	6.8 kΩ	Normal

NOTES

1. Measurements made with power plug (PL101) disconnected but SO101 (dummy) plugged in except in steps f and h.
2. Nothing should be connected to phone plugs during these measurements.
3. Resistance readings were made with a 20 kΩ/V VOM; polarity shown if significant.
4. The forward resistance of a diode depends on the current during measurement. Step "g" in particular shows no change with polarity unless a relatively low-resistance range of ohmmeter is used. Data given was measured on a "RX100Ω" range.

Location of test points and detail parts can be accomplished by reference to Figures 6-2 through 6-6. Identification of parts on these figures corresponds to designators appearing in the over-all schematic diagram, Figure 6-7, as well as in the parts list at the end of this section.

Thorough comprehension of the principles of operation of the oscillator (section 5) is presumed.

6.4.2 PRELIMINARY ANALYSIS (Figure 6-2).

WARNING

Potentially lethal voltages are present on large areas deep inside the main casting and the entire right-hand end, with power on and shield cans removed.

Apply power to the oscillator/power-supply combination and measure the plate current at either of the phone jacks (J100/J101), with a VOM set at about 50-mA full-scale rating. Normally, the plate current is about 20 to

35 mA and it will change slightly with rotation of the main tuning dial, if there is oscillation. Refer to paragraph 2.3.

Measure dc grid voltage with the VOM set for about 20-volts full-scale between the grid G and cathode K tip jacks (J103/J104) on the bracket at the left of the instrument. Normally, the grid voltage is in the range 0 to 18 volts but will be zero for all dial settings, if there is no oscillation.

NOTE

When the Type 1264 Modulating Power Supply is used, make this test in the cw mode of operation.

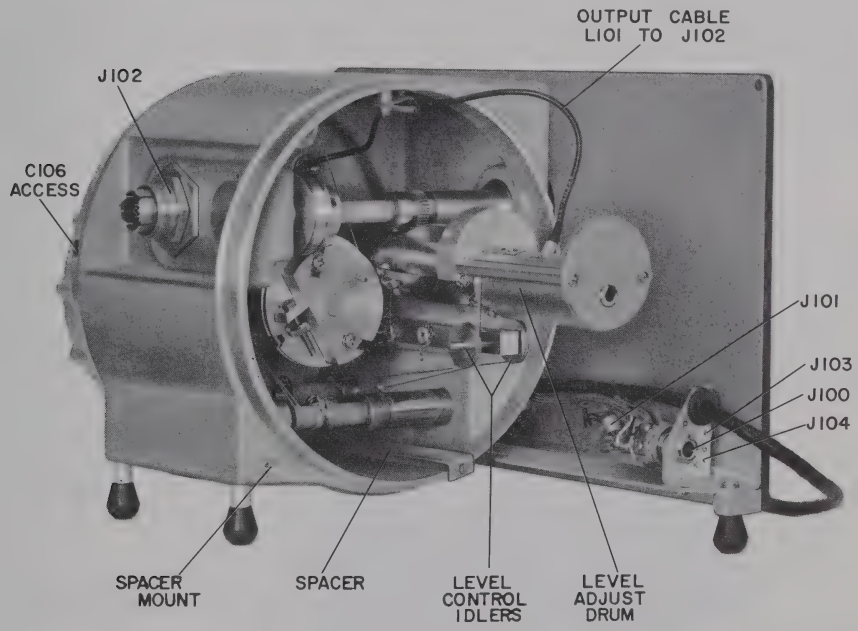


Figure 6-2. Interior view of the Type 1218-B oscillator with left-hand shield can removed. Power supply spacer is shown in storage position.

6.4.3 DETAIL ANALYSIS.

NOTE

The following procedures require at least some disassembly of the oscillator.

Appropriate measurements for trouble analysis are given in Tables 6-2 and 6-3, together with comments on probable causes of failure. One such cause is mistracking of the tuner mechanism, and the procedure for adjustment of this, is described in paragraph 6.8. However, it is recommended that such adjustment be undertaken only if the mechanism is obviously loose, or there is other good reason to think it is wrong. Even tube replacement does not upset the tracking enough to prevent oscillation at medium-low frequencies.

6.5 REMOVAL OF COVERS.

To gain access to the interior of the instrument, for trouble-analysis measurements or to repair defects, it is necessary to remove the rf shield cans on either end of the main casting. The two external shield cans are clamped in position on flanges of the casting by bright-metal bands. Turn off the power supply. Loosen the captive screw associated with each band, to release the clamp. Then, rock that shield gently to loosen it and pull it off. Most of the analysis and adjustments can be made without further disassembly.

The internal cover, found on the right-hand end of the instrument, encloses the cathode tuner (Figure 6-3). It can be removed after all 12 of

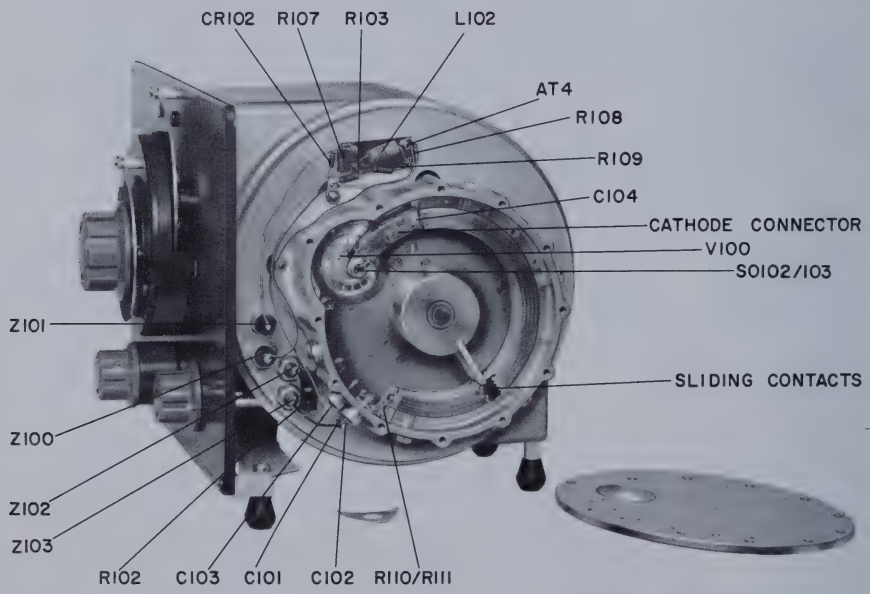


Figure 6-3. Interior view of Type 1218-B oscillator. The right-hand shield can has been removed, as has the cathode-tuner cover plate (at right); the latter is one wall of the tuner trough line.

the screws around its periphery have been removed. Preferably do this with the instrument standing on its left end. For convenience, the 5 3/4-inch-spacer, normally stored inside the main casting (left), or used to attach a power supply, will serve as a support. It mounts in the tapped hole near the left rear foot. (See Figure 6-2).

6.6 TUBE REPLACEMENT.

When it is necessary to replace V100, the type-5675 tube, proceed as follows (see Figures 6-3 and 5-2):

6.6.1 REMOVAL.

a. Remove the right-hand shield cover and cathode-tuner cover plate, as described in paragraph 6.5.

b. Remove the triangular spring washer from the hub of the cathode-tuner rotor.

c. Slide the miniature sockets (SO102/103) gently from the tube heater pins. Swing about 1 1/2 inches of the attached leads out of the grooves in which they are nested.

d. Remove the two small screws in the cathode connector and pull the connector straight up and off of the tube.

CAUTION

Do not snag the spring fingers on the heater pins.

e. Remove the heavy ring that surrounds the tube, after removing the two Phillips-head screws and the cone-tipped screw that hold it.

f. Lift out the fingered spring washer that contacts the grid flange of the tube.

g. Note the orientation of the heater pins and withdraw the tube along its axis.

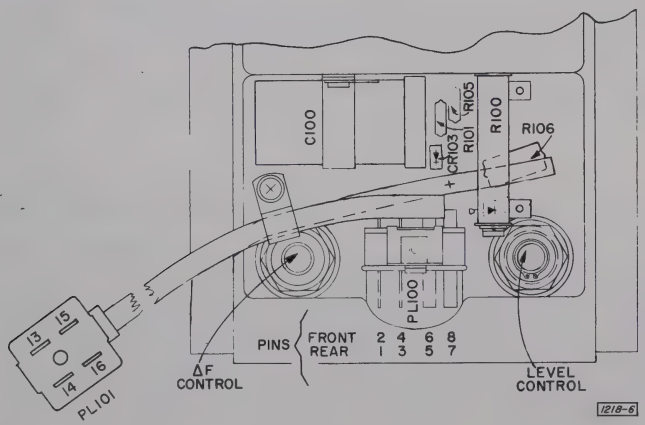


Figure 6-4. Detail part placement between front panel and casting, as seen with panel removed.

6.6.2 INSTALLATION.

To install a new tube proceed as follows:

a. Perform steps a through g of paragraph 6.6.1 in reverse order.

b. Bend and cut the heater pins as shown in Figure 6-5, or use the old tube as a model. Take care to avoid damage to the glass seal.

c. Be sure that the inner, grid, spring washer is in place before the tube is inserted. Remount the second grid washer. One washer should face opposite the other, so that the tips of their fingers press on the grid flange.

d. Seat the ring squarely in place and tighten its three screws evenly, rather than fully tightening one at a time.

e. Tuck the heater wires well into their grooves.

CAUTION

Do not use screws longer than the originals, because damage to dielectric material of built-in capacitors C104 or C105 may result.

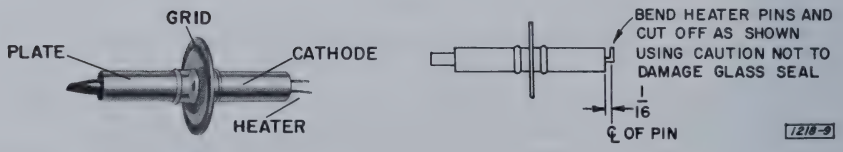


Figure 6-5. Element connectors of type-5675 tube used in the oscillator. Heater pins are shown prepared for installation.

6.6.3 PERFORMANCE VERIFICATION.

Check oscillator for proper operation, as in paragraph 6.3, at low or medium frequency.

It may be necessary to make tracking adjustments to obtain oscillation at normal power level, particularly at high frequency (paragraph 6.8).

Check the dial calibration at two or three points. Since the calibration is affected by tube capacitances, it may be desirable to reset the dial as described in paragraph 6.10. If the calibration accuracy is still poor, select the best replacement from a group of several tubes, preferably made by same manufacturer as the old tube, or return the oscillator to General Radio for recalibration.

6.7 LUBRICATION.

6.7.1 PLATE TUNER.

If the coaxial-line portion of the plate-tuner assembly needs lubrication, return the oscillator to our Service Department.

6.7.2 CATHODE TUNER.

The cathode tuner should be cleaned and relubricated when the sliding contacts (Figure 6-3) become noisy electrically (refer to paragraph 6.3.6). Most of the job can be done with the main dial at its lowest setting. The procedure is as follows:

a. Remove both covers on the right-hand side, as indicated in paragraph 6.5.

b. Wipe the four tracks where the contacts slide (including the one inside the cover) with grease solvent on lint-free swabs. Remove any loose dirt from the interior of the tuner.

c. Apply a thin film of wide-temperature-range grease that meets the MIL-G-3278A specification. Use care not be bend the contacting fingers, because poor contact by even one finger is noticeably detrimental to oscillator operation.

6.7.3 OTHER LUBRICATION POINTS.

There are several moving parts visible after removal of the left-hand shield cover (Figures 6-2 and 6-6), which may require lubrication. As listed below, apply the grease described above, or light, nongumming machine oil. Lubrication is recommended when one of the following squeaks or fails to turn smoothly.

1. Plate-tuner rack and pinion—grease.
2. Idler pulley for steel tracking cable—oil.
3. Two idler pulleys for LEVEL-control cable—oil.
4. Either non metal control shaft (ΔF or LEVEL)—grease.
5. Pivots of drum turned by LEVEL control—grease.
6. The bearing portions of C106, the ΔF control—oil.
7. Vernier drive gear and shaft (front panel)—grease.

6.8 TRACKING ADJUSTMENTS.

6.8.1 GENERAL.

These adjustments are usually necessary after tube replacement and may also be used to compensate for changes in tube characteristics with age. They should NOT be attempted unless clearly necessary.

The frequency of oscillation is determined mainly by the plate line, which is tuned by a rack on its piston and a pinion gear on the main tuning shaft. The cathode line is tuned by the transverse shaft, driven by pulleys and a steel cable. The plate line operates at one-quarter wavelength, whereas the cathode line must be set to three-quarter wavelengths. (Refer to paragraph 5.2.3.)

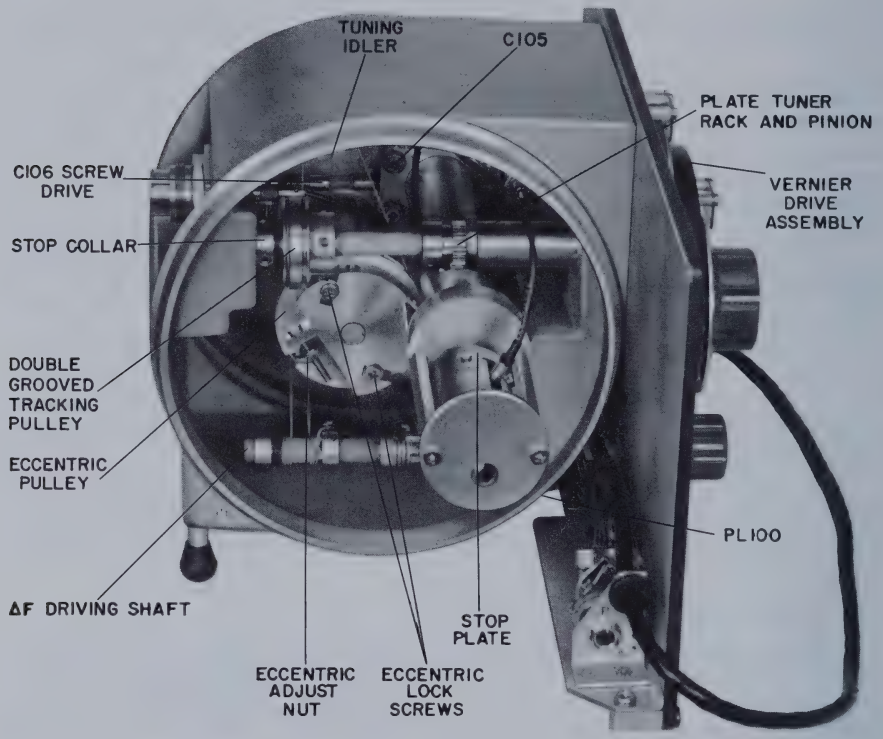


Figure 6-6. Interior view of Type 1218-B oscillator with shield cover removed showing tuning-adjustment points.

6.8.2 LOW-FREQUENCY ADJUSTMENT (Figure 6-6).

The following procedure should be observed to set the frequency tracking adjustment:

a. Arrange a bench test setup to monitor output power as in paragraph 6.3.3.

WARNING

Potentially lethal voltages are present on large areas deep inside the main casting and the entire right-hand end, when operated with the shield cans removed.

b. Set the LEVEL control fully clockwise.

c. Remove the left-hand shield cover.

d. Set to the tuning control to 900 MHz.

e. Loosen the two set screws in the double-grooved tracking pulley with a 3/32-inch Allen wrench, to free the pulley to turn on the main shaft.

CAUTION

Soft metal slugs are used under the set screws, against the ceramic shaft. If the assembly cannot be loosened without risk of breakage, return to General Radio Company for service.

f. Hold the dial fixed and rotate the loosened pulley slightly to resonate the cathode tuner, as indicated by a maximum power output.

g. Retighten the set screws on the pulley.

(To find the quarter-wave mode of cathode tuning, hold the dial fixed and turn the pulley counterclockwise as seen from front panel; do not set the pulley in that position, however). Set the pulley temporarily at the three-quarter-wave mode and increase the frequency.

6.8.3 HIGH-FREQUENCY ADJUSTMENT (Figure 6-6).

The following adjustment is needed if, at frequencies between 1500 and 2000 MHz, the output power drops below specifications:

a. Set up the test arrangement of paragraph 6.3.3.

WARNING

Do not reach behind the eccentric pulley. A voltage difference of from 150 to 300 volts exists between the cathode-tuner casting and the main casting.

b. Set the tuning dial to 1800 MHz.

c. Adjust the LEVEL control slightly from its clockwise stop for maximum output.

d. Loosen by one-half turn both Phillips-head screws that hold the eccentric pulley to its hub. Adjust the eccentricity by use of the knurled nut, until the output is maximized; the frequency dial must be held in a fixed position.

e. Repeat the procedure, if necessary, at higher frequencies to obtain the best compromise.

If the limit of eccentric adjustment is reached, tighten the lock screws in the eccentric pulley and make further adjustment in the position of the double-grooved pulley on the main shaft at 2000 MHz. If the optimum power (after slight adjustment of the double-grooved pulley only) is still below specification, replace the tube.

6.8.4 FINAL TIGHTENING.

When tracking has been optimized, give the set screws and eccentric-pulley lock screws a final tightening. Ascertain that the LEVEL and tuning mechanisms work smoothly, and replace the shield covers.

6.9 ΔF CONTROL ALIGNMENT.

6.9.1 GENERAL.

The capacitive fine-tuning adjustment (C106) is a metal-disk probe inserted into the plate line, near the tube. It is driven by a nonmetal cable which works on a pulley arrangement to actuate a screw drive. A front-panel knob can be rotated about 300° in either direction from a neutral setting to vary the probe penetration. The drive mechanism of the capacitor is shown in Figure 6-6.

6.9.2 FREQUENCY-RANGE CHECK.

If inadequate ΔF range is obtained, check the position of the exposed threaded portion of the driven screw. With the ΔF control at its clockwise stop, the shoulder of the screw should come within 1/32 inch of bottoming on the plate-line flange. If this requirement is not met, mechanical adjustment (paragraph 6.9.3) is required.

6.9.3 MECHANICAL ADJUSTMENT.

WARNING

Remove all power.

To assure smooth operation, the adjustable bracket, which supports the outer end of the C106 screw drive, must be properly aligned and the cable must be strung and tensioned properly.

If the ΔF control is hard to turn (requires torque greater than 10-inch ounces), yet does not need lubrication, the cable may be too tight. To release tension, push on the spring at the point where the cable is attached. Since the spring must act through several turns of the cable on the driving shaft, the tension will not reach equilibrium until after the control has been rotated several times. To reduce the equilibrium tension, reset the collar to relax the spring slightly.

The cable is strung properly when the following requirements are met (see Figure 6-6). At the clockwise stop of the ΔF driving shaft there are two or three turns of cable adjacent to the spring, 3 1/2 turns around the rear half of the exposed threaded portion of the driven screw, and three or more turns around the driving shaft where the cable terminates at a collar. In that position, the screw comes within 1/32 inch of its limit, where the shoulder would bottom on the plate-line flange. The portion of the cable that comes off the top of the driving shaft should start underneath the driven shaft, in order to reverse the direct of rotation.

So that the tuning screw can be set to the required position, the exposed end of the screw is slotted to accept a small screw driver. Access is obtained through a hole in the rear of the main casting (Figure 6-2).

6.10 MAIN FREQUENCY-DIAL ADJUSTMENT.

Tube replacement may affect the frequency-dial calibration. Although the dial calibration is not significantly affected by tracking adjustments, the need for such adjustments implies a change in tube capacitances, which do affect the calibration.

Check the frequency at 1000, 1500, and 2000 MHz, as described in paragraph 6.3.2, and observe the dial reading at each frequency.

To balance out observed errors, loosen the set screws that secure the dial hub to the main tuning shaft. Rotate the dial with respect to the shaft and reset it.

If the frequency errors are still excessive, either tube selection is required, or recalibration by General Radio should be sought. (Refer to paragraph 6.6.3).

To remove the main dial:

a. Mark directly on the dial the position of the fiducial at each stop.

b. Remove the vernier drive assembly (Figure 6-6) and again mark the stop locations, one of which should be unchanged.

c. Remove the dial. Reassemble, using for reference the stop which was unchanged between steps a and b.

6.11 VERNIER-DIAL ADJUSTMENT.

If the 0 position of the 0-100 vernier logging scale does not coincide with a segment boundary on the inner scale of the main dial, lift the knob up against the internal loading spring and rotate the knob, as required, relative to the main dial. (The main dial should not be at either stop.) If necessary, the knob set screws can be loosened to permit repositioning without the restriction of meshing gears.

6.12 LEVEL CONTROL.

The output-power level is controlled by rotation of the output pickup loop (L101), actuated by means of a cable-driven slotted drum on the left-hand end of the plate line (Figures 5-2 and 6-2). A curved metal plate on the top of the drum serves as a stop to protect the hidden end of C106, the fine-tuning probe. It limits the lineal excursion of the coaxial output cable, which is affixed to the plate-line tuning plunger, and prevents it from striking the probe (Figure 5-2). Therefore, if the stop plate (Figure 6-6) is to be removed, it should also be returned to exactly the same position.

The cable is strung as follows. At the clockwise stop, the slot in the drum is inclined 45° from the vertical (toward the front panel). The cable makes two turns around the driving shaft (adjacent to the spring), passes under the inner idler pulley, makes 1-1/2 turns over the drum (in the groove), passes under the front idler pulley, and makes two or more turns around the driving shaft, where the cable is attached to a collar. A screw and washer clamp the cable to the bottom of the drum.

The LEVEL control knob contains a vane that stops rotation by contact with pins in the panel. When the counterclockwise stop coincides with the "zero" (or minimum) output at a medium frequency, the knob is properly set. The pointer is then down, to the left (at 8 o'clock). The clockwise stop should correspond closely to the maximum output level, at medium frequency, or a slightly overcoupled condition at 2000 MHz.

PARTS LIST

Ref No.	Description	Part No.
C100A	CAPACITOR, Electrolytic, 10 μF, 450V	4450-0300
C100B	CAPACITOR, Electrolytic, 10 μF 450V	4450-0300
C101	CAPACITOR, Ceramic, 22 pF ±10% 500V	4400-1895
C102	CAPACITOR, Ceramic, 22 pF ±10% 500V	4400-1895
C103	CAPACITOR, Ceramic, 22 pF ±10% 500V	4400-1895
C104	CAPACITOR, Built In (Dielectric piece)	1218-7060
C105	CAPACITOR, Built In	
C106	CAPACITOR, Variable, assembly	1218-2210
R100	RESISTOR, Power, 6.8 KΩ ±5% 5W	6640-2685
R101	RESISTOR, Power, 27 KΩ ±5% 1/2W	6100-3275
R102	RESISTOR, Composition, 27Ω ±10% 2W	6120-0275
R103	RESISTOR, Composition, 1.6 KΩ ±5% 1/2W	6100-2165
R105	RESISTOR, Composition, 100 KΩ ±5% 1/2W	6100-4105
R106	RESISTOR, Composition, 27 KΩ ±10% 2W	6120-3279
R107	RESISTOR, Composition, 100Ω ±5% 1/2W	6120-2569
R108	RESISTOR, Composition, 220 Ω ±5% 1/2W	6100-1225
R109	RESISTOR, Composition, 120 Ω ±5% 1/2W	6100-1125
R110	RESISTOR, Composition, 100 Ω ±5% 1/8W	6098-1105
R111	RESISTOR, Composition, 100 Ω ±5% 1/8W	6098-1105
Z100	FILTER, Feedthrough, 200 pF ±20%	5280-0400
Z101	FILTER, Feedthrough, 200 pF ±20%	5280-0400
Z102	FILTER, 2500 pF	5280-0100
Z103	FILTER, 2500 pF	5280-0100
L101	INDUCTOR, Loop	Part of 1218-2160
L102	INDUCTOR, 150 μH	4300-3810
V100	TUBE, Type 5675	8380-5675
PL100	PLUG, 8 pin	4220-4600
PL101	PLUG, 5 pin	1218-2220
SO100	SOCKET, Special	1361-0410
SO102	SOCKET	1218-0400
SO103	SOCKET	1218-0400
J100	JACK	4260-6400
J101	JACK	4260-1270
J102	JACK, GR874 Coaxial	Part of 1218-2160
J103	JACK	4260-0970
J104	JACK	4260-0970
CR101	DIODE, Type 1N3036A	6083-1025
CR102	DIODE, Type 1N459A	6082-1011
CR103	DIODE, Type 1N3254	6081-1002

The LEVEL control knob contains a vane that stops rotation by contact with pins in the panel. When the counterclockwise stop coincides with the "zero" (or minimum) output at a medium frequency, the knob is properly set. The pointer is then down, to the left (at 8 o'clock). The clockwise stop should correspond closely to the maximum output level, at medium frequency, or a slightly overcoupled condition at 2000 MHz.

PARTS LIST

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C101	CAPACITOR, Ceramic, 22 pF ±10% 500V	4400-1895
C102	CAPACITOR, Ceramic, 22 pF ±10% 500V	4400-1895
C103	CAPACITOR, Ceramic, 22 pF ±10% 500V	4400-1895
C104	CAPACITOR, Built In (Dielectric piece)	1218-7060
C105	CAPACITOR, Built In	
C106	CAPACITOR, Variable, assembly	1218-2210
R100	RESISTOR, Power, 6.8 KΩ ±5% 5W	6640-2685
R101	RESISTOR, Power, 27 KΩ ±5% 1/2W	6100-3275
R102	RESISTOR, Composition, 27Ω ±10% 2W	6120-0275
R103	RESISTOR, Composition, 1.6 KΩ ±5% 1/2W	6100-2165
R105	RESISTOR, Composition, 100 KΩ ±5% 1/2W	6100-4105
R106	RESISTOR, Composition, 27 KΩ ±10% 2W	6120-3279
R107	RESISTOR, Composition, 100Ω ±5% 1/2W	6120-2569
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Z101	FILTER, Feedthrough, 200 pF ±20%	5280-0400
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Z103	FILTER, 2500 pF	5280-0100
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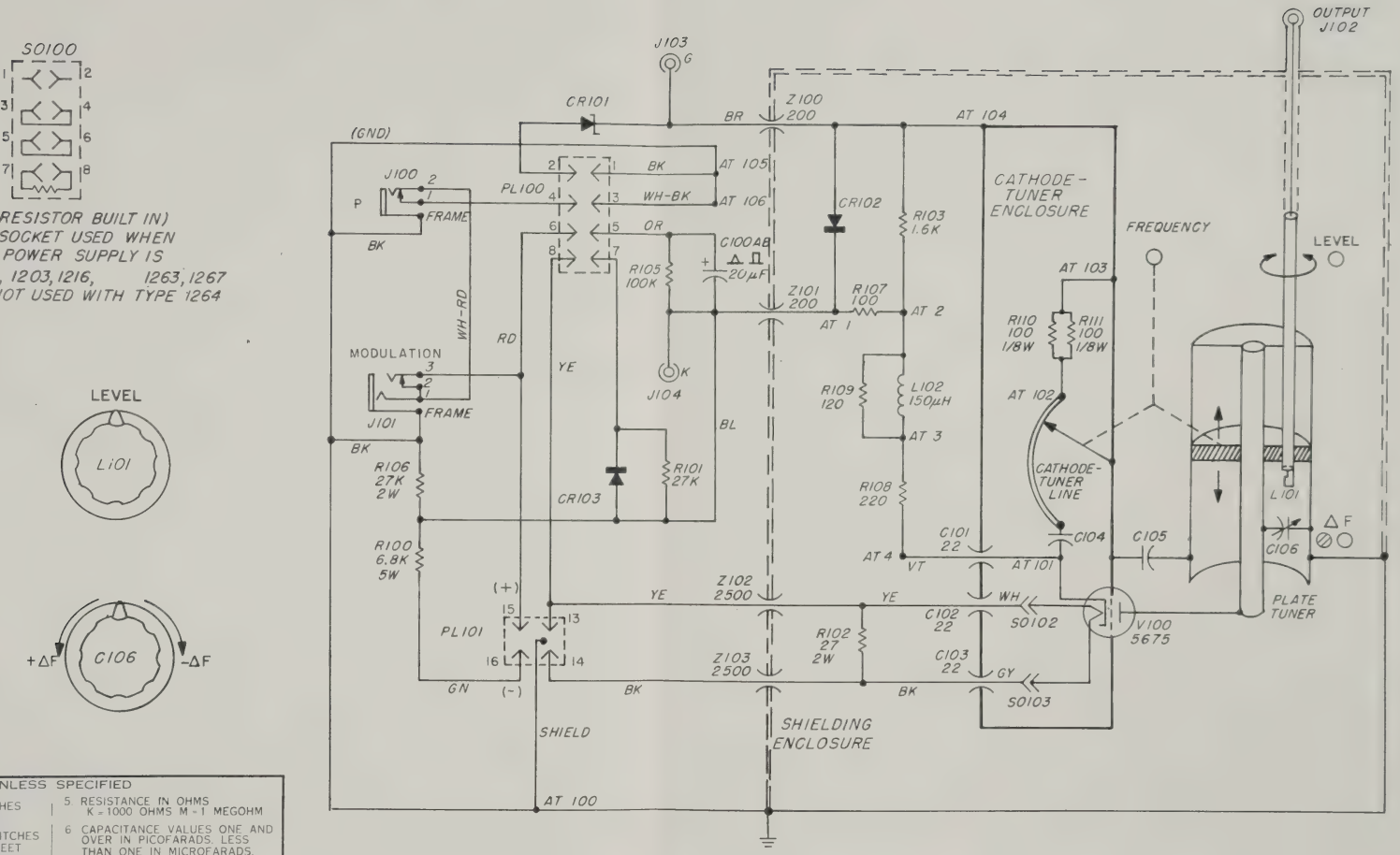
PL100	PLUG, 8 pin	4220-4600
PL101	PLUG, 5 pin	1218-2220
SO100	SOCKET, Special	1361-0410
SO102	SOCKET	1218-0400
SO103	SOCKET	1218-0400
J100	JACK	4260-6400
J101	JACK	4260-1270
J102	JACK, GR874 Coaxial	Part of 1218-2160
J103	JACK	4260-0970
J104	JACK	4260-0970
CR101	DIODE, Type 1N3036A	6083-1025
CR102	DIODE, Type 1N459A	6082-1011
CR103	DIODE, Type 1N3254	6081-1002

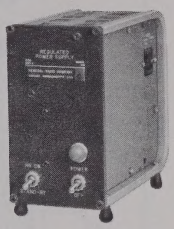


NOTE UNLESS SPECIFIED

1. POSITION OF ROTARY SWITCHES SHOWN COUNTERCLOCKWISE
2. CONTACT NUMBERING OF SWITCHES EXPLAINED ON SEPARATE SHEET SUPPLIED IN INSTRUCTION BOOK.
3. REFER TO SERVICE NOTES IN INSTRUCTION BOOK FOR VOLTAGES APPEARING ON DIAGRAM.
4. RESISTORS 1/2 WATT.
5. RESISTANCE IN OHMS K = 1000 OHMS M = 1 MEGOHM
6. CAPACITANCE VALUES ONE AND OVER IN PICOFARADS. LESS THAN ONE IN MICROFARADS.
7. ◯ KNOB CONTROL
8. ◯ SCREWDRIVER CONTROL
9. AT ANCHOR TERMINAL
10. TP TEST POINT

Figure 6-7. Complete schematic diagram of Type 1218-B Unit Oscillator.

ACCESSORY EQUIPMENT

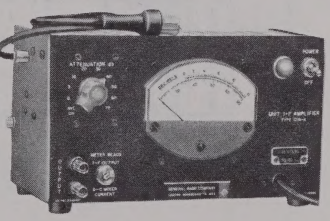


TYPE 1267 REGULATED POWER SUPPLY

Regulated heater and plate supplies provide freedom from line-voltage variations and minimum residual fm. Attaches readily to the oscillator.

TYPE 1269 POWER SUPPLY

A general-purpose power supply with filtered dc plate supply and ac heater supply (both unregulated). Attaches readily to the oscillator. Can be operated from 115-v or 230-v supply.

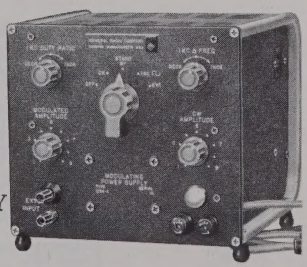


TYPE 1216 UNIT I-F AMPLIFIER

In a heterodyne system, this 30-Mc center-frequency amplifier, which includes a calibrated attenuator and output meter, can be used with the Type 874-MRL Mixer Rectifier as the detector. The amplifier also supplies plate and heater power to the heterodyning oscillator. Can be operated from 115-v or 230-v supply.

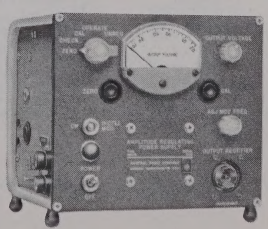
TYPE 1264 MODULATING POWER SUPPLY

Provides 100% pulse and square-wave modulation and can also be used as a source of adjustable, well-regulated, plate power and unregulated heater power. Attaches readily to the oscillator. Can be operated from 115-v or 230-v supply.



TYPE 1263 AMPLITUDE-REGULATING POWER SUPPLY

For amplitude-regulating cw or 1-kc square-wave modulated output. Maintains oscillator output at a preset value in spite of frequency, load, and line-voltage variations. Particularly useful when the oscillator is mechanically driven. Attaches readily to the oscillator. Can be operated from 115-v or 230-v supply.



GR874 COAXIAL COMPONENTS

GR874 CABLE CONNECTORS

APPLICABLE CABLE TYPES		CONNECTOR TYPE	CABLE	CABLE LOCKING	PANEL FLANGED	PANEL LOCKING	PANEL LOCKING RECESSED	PANEL LOCKING (KEYED)
	50-OHM	874-A2	-CA	-CLA	-PBA	-PLA	-PRLA	-PBRLA
	50-OHM	RG-8A/U RG-9B/U RG-10A/U RG-87A/U RG-116/U RG-156/U RG-165/U RG-166/U RG-213/U RG-214/U RG-215/U RG-225/U RG-227/U	-C8A	-CL8A	-PB8A	-PL8A	-PRL8A	-PBRL8A
	NON-50-OHM	RG-11A/U RG-12A/U RG-13A/U RG-63B/U RG-79B/U RG-89/U RG-144/U RG-146/U RG-149/U RG-216/U						
	50-OHM	874-A3 RG-29/U RG-55/U (Series) RG-58/U (Series) RG-141A/U RG-142A/U RG-159/U RG-223/U	-C58A	-CL58A	-PB58A	-PL58A	-PRL58A	-PBRL58A
	NON-50-OHM	RG-59/U RG-62/U (Series) RG-71B/U RG-140/U RG-210/U	-C62A	-CL62A	-PB62A	-PL62A	-PRL62A	-PBRL62A
	50-OHM	RG-174/U RG-188/U RG-316/U	-C174A	-CL174A	-PB174A	-PL174A	-PRL174A	-PBRL174A
	NON 50-OHM	RG-161/U RG-187/U RG-179/U						

Example: For a locking cable connector for RG-8A/U, order Type 874-CL8A.

GR874 ADAPTORS

TO TYPE		TYPE 874-
APC-7		QAP7L*
BNC	plug	QBJA
		QBJL*
	jack	QBPA
C	plug	QCJA
		QCJL*
	jack	QCP
GR900		Q900L*
HN	plug	QHJA
	jack	QHPA
LC	plug	QLJA
		QLPA
LT	plug	QLPT
	jack	QLTJ
Microdot	plug	QMDJ
		QMDJL*
	jack	QMDP
N	plug	QNJA
		QNJL*
	jack	QNP
		QNPL*
OSM/BRM	plug	QMMJ
		QMMJL*
	jack	QMMP
		QMMPL*
SC (Sandia)	plug	QSCJ
		QSCJL*
	jack	QSCP
TNC	plug	QTNJ
		QTNJL*
	jack	QTNP
UHF	plug	QUJ
		QUJL*
	jack	QUP
UHF 50-Ω Air Line	7/8-in.	QU1A
	1-5/8-in.	QU2
	3-1/8-in.	QU3A

*Locking GR874 Connector

Example: To connect Type 874 to a type-N jack, order Type 874-QNP.

OTHER COAXIAL ELEMENTS

TYPE 874-	DESCRIPTION	TYPE 874-	DESCRIPTION
A2	50-Ω cable (low loss)	MB	coupling mount
A3	50-Ω cable	MR, MRL, MRAL	mixer-rectifier
D20L, D50L	20-, 50-cm adjustable stubs	R20A, R20LA	patch cord, double shield
EL, EL-L	90° ell	R22A, R22LA	patch cord, double shield
F185L	185-MHz low-pass filter	R33, R34	patch cord, single shield
F500L	500-MHz low-pass filter	T, TL	tee
F1000L	1000-MHz low-pass filter	TPD, TPDL	power divider
F2000L	2000-MHz low-pass filter	U	U-line section
F4000L	4000-MHz low-pass filter	UBL	balun
FBL	bias insertion unit	VCL	variable capacitor
G3, G3L, G6, G6L G10, G10L, G14, G14L G20, G20L	3-, 6-, 10-, 14-, and 20-dB attenuators	VI	voltmeter indicator
		VQ, VQL	voltmeter detector
		VR, VRL	voltmeter rectifier
GAL	adjustable attenuator	W100	100-Ω termination
JR	rotary joint	W200	200-Ω termination
K, KL L10, L10L L20, L20L L30, L30L	coupling capacitor 10-, 20-, and 30-cm rigid air lines	W50B, W50BL	50-Ω termination
		WN, WN3, WNL	short-circuit terminations
		WO, WO3, WOL	open-circuit terminations
		X	insertion unit
LAL	35-58 cm adjustable line	XL	series inductor
LK10L, LK20L	constant-Z adjustable lines	Y	cliplock
LR	radiating line	Z	stand
LTL	trombone constant-Z line	-9508	air line inner conductor
ML	component mount	-9509	air line outer conductor

CONNECTOR ASSEMBLY TOOLS

TYPE 874-	FUNCTION
TOK	Tool Kit
TO58	Crimping Tool
TO8	Crimping Tool

MISCELLANEOUS COAXIAL CONNECTORS

CONNECTOR TYPE	TYPE NO.	USED WITH
Basic	874-B	50-ohm air line
Basic Locking	874-BBL	50-ohm air line
Panel Locking	874-PLT	Wire lead
Panel Locking Recessed	874-PRLT	Wire lead
Panel Locking Feedthrough	874-PFL	Type 874 patch cords

L suffix indicates locking Type 874 Connector.

FOR COMPLETE DETAILS, REFER TO THE GENERAL RADIO CATALOG.

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